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STAFF APPRAISAL REPORT

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

November 23, 1982

Projects Department
East Asia and Pacific Regional Office

CURRENCY EQUIVALENTS

Currency Unit - Won (W)

US$1	=	W 745 (as of November 1982)
US$1.34	=	W 1,000
US$1 million	=	W 745 million
US$1,340	=	W 1 million

FISCAL YEAR

January 1 - December 31

WEIGHTS AND MEASURES

1 meter (m)	=	3.2808 feet (ft)
1 kilometer (km)	=	0.62 mile (mi)
1 square kilometer (km^2)	=	0.3861 square miles (sq mi)
1 hectare (ha) = 0.01 km^2	=	2.4711 acres (ac)
1 kilogram (kg)	=	2.2046 pounds (lbs)
1 metric ton (m ton)	=	2,204.6226 pounds (lbs)
		1.1023 short tons (sh tons or 2,000 lbs)
		0.9842 long tons (lg ton or 2,240 lbs)

PRINCIPAL ABBREVIATIONS AND ACRONYMS USED

ADT	-	Average Daily Traffic
BPR	-	Bureau of Public Roads
DBST	-	Double Bituminous Surface Treatment
EPB	-	Economic Planning Board
ERR	-	Economic Rate of Return
FFYP	-	Fifth Five Year Plan
GNP	-	Gross National Product
KHC	-	Korea Highway Corporation
KMPA	-	Korean Maritime and Ports Authority
KNR	-	Korean National Railroad
MOC	-	Ministry of Construction
MOF	-	Ministry of Finance
MOHA	-	Ministry of Home Affairs
MOT	-	Ministry of Transport
VOC	-	Vehicle Operating Costs

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

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MAP Provincial and Country Road Project (IBRD - 16730)

INTRODUCTION

The Government of Korea has requested Bank Group assistance in the financing of a program to improve some 1,000 km of county (gun) or tertiary network roads throughout the country and to establish and equip appropriate maintenance organizations for the provincial and county road networks. Bank Group support for the development of Korea's roads has been extended through four previous projects, starting with a First Highway Project (Loan 769-KO) in 1971. The proposed project would, however, be the first to address the problems of the tertiary road network, which is of special relevance to Korea's agricultural and rural development efforts. The development, construction and maintenance of these roads is a responsibility of the Ministry of Home Affairs (MOHA). An important institutional objective of the proposed project would be to strengthen MOHA's capability to manage the tertiary road development and to maintain provincial and county roads.

The project was prepared by MOHA with assistance from consultants (BCEOM of France and local consultants) whose work was financed under the Fourth Highway Project (Loan 1640-KO). Preappraisal missions visited Korea in October 1981 and February 1982 and this report is based on the findings of an appraisal mission comprising Messrs. B.P. Kennedy (Engineer) and A.F. Ballereau (Economist) which visited Korea in June 1982; the Report also incorporates some of the findings of a transport sector survey which completed its field work at the same time.

I. TRANSPORT SECTOR

A. Geographic and Economic Setting

1.01 The Republic of Korea has a land area of 98,500 sq km. About 70% of the land area is mountainous and agriculture is confined to about 22,600 sq km, or 23% of the total area, mainly in the river valleys, lower hillsides and coastal plains. The climate is seasonal with very cold dry winters and hot humid summers. Annual rainfall averages 800 mm to 1,400 mm with about 60% falling between June and September. The land mass is drained by a well-developed river system with seasonal variations in flow which give rise to frequent flooding. The rugged terrain, river system and severe winter climate make the construction of transport facilities, particularly roads, difficult and costly.

1.02 The population is presently estimated at 38.2 million and growing at an annual rate of 1.9%. Population density is estimated at 382 per sq km of total area or 1,670 per sq km of agricultural land. Urban population is estimated to be growing at an annual rate of 4.9% and has increased from 40.7% of the total in 1970 to 54.8% in 1982. The increasing urban population has created significant transport demand in the areas around the cities and industrial centers and particularly in the Seoul greater metropolitan area.

1.03 Korea's export-led industrialization has been among the most successful examples of economic development in recent history. During 1962-78, real GNP grew by 10% p.a. and per capita income more than tripled in real terms. Coupled with industrialization and urbanization, major developments and changes in the transportation sector complemented and supported the transformation of Korea's economy. Passenger traffic tripled between 1964 and 1971 and tripled again by 1981; freight increased nine times and five times respectively during the same periods.

B. The Transport System

1.04 Throughout much of the past 20 years, the transport system has been strained by the demands of rapid growth and it has required massive public sector investments in transport infrastructure. The Government has been allocating regularly, since the beginning of the Second Plan in 1967, about one quarter of its total capital expenditure to expand and modernize transport infrastructure. Investments have been concentrated on the Seoul-Busan axis where most industrial development is taking place and other corridors serving the northeastern and southeastern parts of Korea.

1.05 Substantial changes in the modal distribution of traffic are illustrated by traffic statistics for the 1961 to 1981 period (Tables 1.1 and 1.2). Freight traffic moving by rail, although showing growth in absolute terms, fell from 88% of total ton-km to 46%, while the road and coastal shipping shares increased from 8% to 21% and from 3% to 32%, respectively. For passenger traffic, the rail share of total passenger-km fell from 53% to 25% over the same period, while the road share increased from 45% to 73%. These changes reflect both the economic advantages of the various modes and the different growth rates experienced between industries served, as rail and coastal shipping increasingly were concentrated on long distances and bulk commodities, while road transport handled the short distance and more general cargo. In addition, rapidly expanding personal consumption generated large increases in personal travel, further fueled by changes in consumption patterns. Road transport has been the main beneficiary of these increases.

1.06 The Government of Korea's (GOK) basic objective over the past has been to increase the capacity of the system in line with projected traffic growth and to avoid major bottlenecks. This objective has been largely achieved. The present system is reasonably balanced and there is no substantial uneconomic allocation of traffic among the various modes. Investment in transportation have been linked to broader concerns in Korea's spatial and economic planning. For example, considerable efforts have been made to develop new industrial complexes in coastal areas, to take advantage of Korea's natural potentials in harbors and to exploit low-cost coastal shipping while avoiding excessive congestion on road and rail. Similarly, in its efforts to ensure that appropriate development priorities were reflected in the allocation of scarce transportation means among the competing claims, the Government has maintained fairly tight regulations in the sector, involving strict licensing of operators in road transport and shipping, and administered pricing for all transport activities. Korea's

vehicle fleet has been kept small due to a policy of high taxation of cars and high prices for gasoline.

1.07 Large investments in transportation infrastructure have been complemented by a considerable effort to improve the efficiency of the transportation system, through the establishment and strengthening of institutions to plan, construct, maintain and operate the facilities and services. In the public sector, institutions such as the Korean National Railroad (KNR), the Bureau of Public Roads (BPR) in the Ministry of Construction (MOC), the Korean Highway Corporation (KHC), the Korean Maritime and Port Authority (KMPA) have been strengthened or established in many instances with increasing financial and managerial responsibility as semi-autonomous public corporations. In the private sector, a highly efficient contractor system has evolved for civil works which reflects both the insistence on competitive bidding in the award of contracts as a matter of policy, and the large volume of construction work that has been carried out in Korea during the past 20 years. There are now some 500 firms capable of handling a broad range of public works. Furthermore, with Government encouragement, the major construction firms have successfully expanded their construction activities overseas; in 1981, Korean contractors won overseas contracts valued at US$13.6 billion.

1.08 The Bank has played an active role in advising and assisting the Korean authorities in pursuing their transport objectives. Since 1962, the Bank Group has assisted the KNR through seven railway projets amounting to US$434 million. The first five projects have been satisfactorily completed and a sixth is almost fully disbursed. Cost comparisons indicate that rail transport is still the most economic means of moving bulk cargo over medium and long distances, and for passenger traffic over long distances. Bank-supported investments have concentrated on improved capacity and service relating to these functions. KNR's efficiency is among the highest of any rail system in the world in 1981, with staff productivity per employee of 800,000 measured in terms of traffic units (passenger-km plus net ton-km). The Bank has also maintained an active dialogue on the railway's financial situation, investment plans, level and structure of tariffs. After some deterioration in the 1970s, Government agreed to implement a financial recovery plan for KNR as part of the seventh (ongoing) railway project. Discussions of a revised plan, following the severe downturn of the economy in the early 1980s, are continuing. Meanwhile, a coal and cement distribution project which was recently appraised would strengthen the capacity of the railways, ports and inland terminals to cope with the expected increase in transport of these commodities, resulting partly from large coal imports substituting for oil.

1.09 Substantial assistance has also been extended for port development. In part related to Korea's export drive, freight traffic through the ports has increased from about 13 million tons in 1966 to over 120 million tons in 1981. This large increase resulted in serious port capacity problems, particularly at Busan, the biggest port, which handles 30% of the country's

external trade and is chronically congested. Containerization was introduced in Busan with the assistance of the Bank under two port projects totalling US$147 million; the Saudi Fund for Development participated with the Bank in the financing of the first Busan Port Project. A third ports project, to further improve container handling capacity, is now under consideration, and would be in addition to port works under the coal and cement distribution project mentioned above.

1.10 The four previous Bank-financed highway projects have had a major impact in assisting Government with the improvement and expansion of the national and provincial road networks and with institution building in the MOC. Significant policy changes, relating to the highway subsector, which were effected through the highway projects include the adoption of more appropriate road standards, revisions of regulations governing vehicle weights and dimensions, and a modified Government policy on toll roads. The MOC's organization to maintain the national road network was established and strengthened through the provision of technical assistance and road maintenance equipment. Korean consulting firms have benefitted through their association with foreign consultants on the design of road projects. Results of the three projects that have been completed are highly satisfactory. These are discussed more fully in paras. 2.31 and 2.32.

C. Transport Objectives and Issues in the 1980s

1.11 The period of rapid and sustained growth in the Korean economy came to an abrupt close in 1979, following the second major oil price increase, the subsequent worsening of the international environment, and the political transition. Near stagnation, accompanied by severe inflation and balance of payments problems were experienced between 1979 and 1981. A modest recovery is now in progress, with benefits from Government's determined efforts to master inflation (which is expected to decline from 29% in 1980 and 12% in 1981 to about 7% this year), plus a remarkable improvement in the balance of trade. Nevertheless, the medium-term prospects for a resumption of Korea's former rapid progress remain uncertain. The impact of these developments on the transportation sector is two-fold. On one side, the timing of investments needed to sustain further improvements in transport capacity and quality of service will be influenced by growth-induced traffic expansion. On the other side, the capacity of the public sector to finance the necessary upgrading and expansion of infrastructure and facilities in transportation may be sharply constrained by budgetary limitations. For the medium term, the Fifth Five Year Plan (FFYP) projects a GNP growth rate of 7.5% p.a. over the period 1982-86, with a corresponding increase in transport demand estimated at about 47 billion passenger-km and 10 billion ton-km, respectively 50% and 30% above fourth plan period outcomes (Tables 1.3 and 1.4). Investment in transportation (public and private) is expected to increase by about 45% and remain at close to 14% of the total planned outlay as in the Fourth Plan. This amounts to some US$16.3 billion, calculated at 1980 prices and exchange rates.

However, investments in subways and aviation will absorb a larger fraction of the total as will road vehicles and ships. Hence, real investment in the railway system, road and port infrastructure would increase by less than 20% above fourth plan outlays (Table 1.5).

1.12 Whether or not economy-wide growth, transport demand and investments conform to plan expectations, it seems clear that the period of most rapid development in Korea's basic transport infrastructure is now over. On the other hand, the increasingly complex traffic patterns and higher traffic densities, the growing requirements for maintenance of the expanded system, and the need to conserve energy, will call for even greater efforts to maximize efficiency of service and the use of scarce investment capital in this capital-intensive sector. Policies relating to pricing and regulation of transport plus improved planning in respect of system development, are crucial in the now more demanding economic environment. The preliminary finding of the Bank's recent sector survey suggests that there is scope for improvement in several areas.

1.13 Despite considerable efforts, spatial planning of the transportation system is still hindered by generally inadequate interagency coordination, a comparatively limited expertise in planning and economic appraisal techniques, and in the capacity to undertake appropriate longer-term pre-investment studies. World Bank efforts to provide support and encouragement for these activities has met with mixed success. In 1970, the Government set up a Transport Planning Office in the Ministry of Transport (MOT) on the recommendation of a study financed under a Transport Technical Assistance Credit. The Government tried further, in 1975, to improve transport coordination via a Transport Coordination Committee (TCC) with representation from the various ministries most directly concerned. The TCC, however, has not, in practice, been able to carry out its responsibilities for the coordination of transport sector investment very satisfactorily. More effective mechanisms are yet to be worked out. Meanwhile, the Budget Bureau, located in the Economic Planning Board (EPB), exercises considerable influence on year-to-year transport investment decisions through its budgetary control powers. Currently, a Bureau of Project Evaluation, established in 1976 in EPB, is showing interest in transport planning, spurred by the necessity to cut back the public sector investments program. However, its responsibilities are at present limited to reviewing individual major investment proposals submitted by executing agencies on a piecemeal basis. The Bureau's capability in project analysis is being strengthened under the Bank's 1981 Structural Adjustment Loan.

1.14 The Bank has also, through various projects, provided active support and finance for technical assistance for a range of feasibility and planning studies relating to national transport development, urban transportation needs, inter-modal alternatives along major traffic axes (such as the Seoul-Busan corridor) in addition to more conventional engineering design work for proposed projects. Here, too, the record of accomplishment is patchy, with experience tending to show a pattern of relatively slow progress, reflecting in part the difficulties of sectoral planning and transport coordination in the Korean context.

1.15 Pricing policy and the regulatory framework have been a feature of Bank-Government dialogue for many years. In the 1970s, emphasis was given to supporting Government's efforts to establish agencies such as KNR, and KMPA on a sound financial basis, with investment planning linked to appropriate tariffs and charges in regard to rail transport and ports. The role of the Bank has been quite effective in this regard, although the priority given to reducing inflation in the past two years has led to some reluctance to raise tariffs - for example in rail transportation - in line with changes in costs. The Bank has also assisted Government in the review of transport and traffic regulation, notably in regard to licensing of common carriers, road vehicle taxation, axleloading and similar issues relating to road transportation (see discussion in paras. 2.07 through 2.09 below).

1.16 It is expected that the Bank's policy dialogue would be strengthened in future years through the increasing emphasis being given to a sector and subsector approach in transport lending in Korea. The roads project now proposed will deepen and broaden our involvement in the road subsector by extending assistance, for the first time, to the Ministry of Home Affairs (MOHA) which deals with the maintenance of provincial roads and the maintenance and improvement of county roads. This new involvement will also provide the Bank with an opportunity to improve coordination of road planning between MOC and MOHA, and will strengthen the basis for a possible highway subsector loan. Similarly, the recently completed ports study examined broadly which ports should be developed to handle the nation's traffic through the next decade and may lead to a port subsector loan. For railways, the Bank has traditionally made sector type loans, financing time slices of KNR's investment plans with the sixth and seventh railway projects covering respectively 1978/79 and 1980/81 investments.

1.17 Besides these subsector operations, we are assisting the Government in developing multimodal projects. The first is the proposed coal and cement distribution project, involving railways and ports. It will be followed by projects directed toward increasing the capacity of the system in certain high priority areas and corridors rather than expanding the system as a whole. The Bank will assist in developing an integrated modal approach to meet the very high transport demand near main urban areas where a dense network of facilities is needed. The complementarity of the various modes will be promoted by developing interconnecting terminals so as to facilitate the use of the most economical and efficient transport system. To this effect, three separate multimodal transport studies have been discussed with Government: one concerning the Seoul-Busan transport corridor and the feasibility of rail capacity increase between Seoul and Daejon is about to start, the second concerning the Seoul Metropolitan region covering the Gyeonggi province is to follow in CY84 and the third covering the southeast coastal region from Suncheon to Pohang where most heavy industries are concentrated will follow later.

1.18 Bank transport projects also contain specific components to promote the local transport consulting industry. A Korean consultant was responsible for both a coal and cement distribution study and a national comprehensive transport study. Korean consultants are also closely associated and assuming an increasing share of the work and responsibilities with studies under the Bank's railroad and port projects. The development of a competent consulting industry in the transport sector is likely to lead to significant import substitution and export of such services.

II. HIGHWAY SUBSECTOR

A. The Network

2.01 The public road network totals about 87,000 km comprising 13,400 km of national roads, 9,700 km of provincial roads, 11,500 km of county roads and 52,400 km of village access roads (see Table 2.1). In addition, there are 15,500 km of city roads, mostly streets. The national highways include 1,245 km of toll expressways of which 492 km are four-lane divided and 753 km are two lane. The system of classification of roads is flexible enough to facilitate transfers from county to provincial and from provincial to national roads whenever traffic volumes warrant such transfer. Road density at 0.9 km/sq km is generally sufficient to serve transport needs, particularly as about 70% of the total land areas is mountainous, but most of the road network still needs improvement. Despite heavy investments in road improvements since 1967 only 56% of the national roads, 8% of the provincial roads, and 5% of the county roads are paved and a high level of investment will continue to be required to ensure an adequate level of service for growing traffic volume. The poor state of the county road network has hampered the development of agriculture and restricted personal mobility. The proposed project includes a first phase improvement program for these roads (paras. 3.05 and 3.06). It also includes assistance to Government to set up an effective organization for the maintenance of provincial and county roads (para. 3.07).

B. Traffic and Road Transport Industry

Motor Vehicles

2.02 The motor vehicle fleet in Korea is still small when compared with other countries of similar and even lower income levels. In 1980, the 528,000 four wheel road vehicles registered in Korea amount to only 13.9 per 1,000 persons (Table 2.2). The ratios are 20.0 in Thailand, 20.9 in the Philippines, 48.2 in Malaysia, although Korea has a higher per capita income. There are many reasons why Korea's vehicle fleet is small: the high taxation of private cars, the high vehicle operating costs, the restrictive licensing of commercial vehicles (para. 2.07), the high cost of locally manufactured vehicles, and the relatively under-developed road network. Only 20 years ago, Korea had less than 1,000 km of paved roads.

2.03 The vehicle fleet has, however, been growing rapidly. Excluding motorcycles, growth averaged 15% p.a. during the First Plan (1962-66), and 20% p.a. during the Second Plan (1967-71). Growth slowed down during the early years of the Third Plan due to the economic stabilization policy in 1971/72 and the oil crisis in 1973/74. Since 1975, however, the growth has accelerated again and averaged 22% p.a. from 1977 to 1980. Of all four wheel vehicles, private cars increased the fastest, doubling since 1977. The actual number is still small but likely to increase rapidly. The situation may be compared to that of Japan which had only 200,000 cars or 2.8 per 1,000 persons in 1958 and saw its car population explode within 20 years to about 25 million in 1980 or almost 217 per 1,000 inhabitants. The future situation in Korea will depend upon the willingnes or ability of the Government to keep the current high level of taxation in line with increasing incomes. However, the combined pressure of the public and of the car manufacturers may force Government to let the taxation of private cars erode in relation to incomes.

2.04 Local production of motor vehicles has increased rapidly over the last decade from about 7,000 four wheel vehicles in 1967 to a maximum of 200,000 in 1979. However it dropped to 120,000 in 1980 (Table 2.3). This growth was fostered by restrictive import licensing and high customs duties. Nearly all motor vehicles are now locally manufactured or assembled under license from the US, Japanese and Italian manufacturers and contain nearly all locally manufactured parts. Exports are presently not very significant. Forecasts by EPB indicate that production would overtake present capacity of 225,00 vehicles per year in 1983 and reach 625,000 vehicles by 1986, with exports accounting for 20% of production. Accordingly, large investments are now being considered to expand and retool existing automobile plants.

Traffic

2.05 Road transport has grown rapidly over the last 15 years, not only in absolute terms but also in relation to other modes, particularly railways. About 22% of freight traffic in tons-kms is now carried on highways compared to only 8% in 1961. Road freight traffic grew twice as fast as all freight traffic, averaging 45% p.a. in 1967-71 and 13% p.a. in 1972-76. However, it registered a 4.2% actual decrease in 1977-81. Nevertheless, the share of freight traffic by road is expected to continue increasing in the long-term although probably more gradually. Passenger traffic on highways also grew rapidly, at 14.0% p.a. in passenger-km in 1967-71, 13.6% in 1972-76 and 9.5% in 1977-81, and in 1981 it amounted to over two thirds of the total with one third going by rail, a complete reversal of the situation in 1961. This trend is expected to continue as the railways concentrate more on their long distance express services.

2.06 Traffic counts on the national highways have been made since 1965 by MOC, assisted by the provincial authorities and are now carried out twice a year. Their reliability has improved, and they are now used in planning highway improvements. In accordance with the Loan Agreement for the Second

Highway Project (Loan 956-KO), MOC began to count, record and analyze traffic data on the provincial road network in 1973 and by 1981, there were regular counts on the provincial roads, covering most of the network. Traffic counts on the county roads have only recently been started by MOHA with assistance from consultants. However, under the proposed project, the planning of county road development will be improved and a regular traffic counting system will be introduced. The traffic data available show that annual growth rates of traffic volumes were high during the First and Second Plans (1962-71), but fell off in the Third Plan (1972-76). Rapid growth of traffic resumed in 1976 and peaked in 1979 but decreased again in 1980. Gasoline consumption in 1975 was one-third lower than in 1973 following the oil crisis. Rapid growth of fuel consumption resumed in 1976 and peaked in 1979 (Table 2.4).

Road Transport Industry Regulation

2.07 Commercial vehicle licensing has been rather restrictive in Korea. Restrictions included: (a) issuing licenses only to enterprises having a minimum of 20 vehicles in cities or 10 in rural counties; (b) imposing quotas on total numbers of vehicles in each province as well as service areas or routes; /1 and (c) regulating rates and fares for freight and passenger traffic. In line with the Loan Agreement for the Second Highway Project, (Loan 956-KO) the Government has partially relaxed the restrictions above. The minimum number of vehicles necessary to obtain a license was lowered at the county level from 10 to 5 vehicles. Also the minimum vehicle requirements can be waived where deemed necessary, in the light of transport demand and for particular areas. The minimum vehicle requirements were removed for pick-up truck services, and the operation by owner-operators of taxis and "area" trucks was allowed. A total of 978 trucking companies now operate in Korea; 948 under "area" licenses and 32 under "route" licenses. There are 650 bus companies operating almost 30,000 buses, about 50% in urban areas (Table 2.5). Regulations concerning fares and minimum fleet requirements on buses remain virtually unchanged, the reason given by Government is that present regulations are necessary to ensure regular service and safety.

2.08 The relaxation of regulation, however, has not gone far enough. This is evidenced by the low growth of the common carrier fleet, which accounted in 1980 for only 53,000 trucks versus 165,000 in the private trucking fleet while in 1967 with 15,000 trucks, it was three times larger. A similar evolution is noticeable also for buses which are operated more and more by private enterprises, schools, and farmers cooperatives. Since transport users needs are not fully served by commercial operators (in spite of subsidies offered by MOT in remote rural areas) private entities have more and more started to operate their own trucks and buses. MOT is currently

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/1 An "area" license authorizes service within a limited area generally the Province, and a "route" license authorizes service along a given route between points A and B.

reviewing the licensing system. Unfortunately, indications are that the Government may not opt for further relaxation of existing regulation. The Bank will continue to review this issue in its sector dialogue with the Government. However, the Government is at present implementing a subsidized plan to improve public bus services in the remote rural areas for villages of over 100 households where their availability, frequency and quality are deficient because of poor road conditions and remoteness which make operations of standard buses unprofitable. Furthermore, the Government will, under the present project, promote the introduction of unscheduled transport services for the rural population having no access to public road transportation. Such unscheduled and shared transport services will be allowed first on an experimental basis in a selected area, and will operate on demand as large taxis. The all-weather vehicles such as modified pickups or mini-buses will be designed to pick up and unload, easily and on demand, up to 15 passengers and some freight. The ownership of those unscheduled vehicles will not be restricted by minimum fleet requirement and their modalities of operation, including the routes and fares, will be determined by market rules. Such a system has proven efficient and inexpensive in the rural areas of other Asian countries. MOHA in consultation with MOT will handle the experiment and monitor it. During negotiations, an implementation schedule outlining the major critical steps needed to promote such services was agreed with the Government.

2.09 Regulations on vehicle weights and dimensions were dealt with under previous Bank loans and are satisfactory.

C. Road Safety

2.10 Statistics available in the Ministry of Transport show that a serious road accident problems exist in Korea. In 1975, when vehicle ownership was at a rate of 57 per 10,000 of population there were some 190 fatalities per 10,000 vehicles. In 1978, with a vehicle ownership rate of 107 per 10,000 population there were 129 fatalities per 10,000 vehicles. Although the figures show some improvement since 1975, a comparison with other countries reveals the seriousness of the problem. For instance, the normal accident rate in a developing country, with a vehicle ownership rate of 280 per 10,000 population, is about 48 fatalities per 10,000 vehicles.

2.11 Road Traffic Safety in Korea is the joint responsibility of the Traffic Police, the Transportation Safety Promotion Authority and the Road Traffic Safety Association. The Traffic Police, under MOHA, enforce some safety-related regulations such as speed limits, etc. and collect and publish traffic accident statistics. The Transportation Safety Promotion Authority was set up in December 1979 under the general control of the MOT Responsibilities of the Authority cover all modes but are limited to the inspection of motor vehicles, railroad cars, ships, aircraft, rails and cables, from which activity some 90% of its revenues accrue. The Road Traffic Safety Association was attached to the Traffic Police prior to 1980, when it was reconstituted under the Road Traffic Law, as a civilian non-profit corporation, reporting to MOHA. Its functions are to analyze traffic accident data, do research and studies on road safety, train and educate drivers, and prepare and organize propaganda related to road safety. The Association has eleven provincial branch offices and one branch in Seoul and Busan. Its main

source of revenue comes from the drivers' licensing fees. While the Association is virtually autonomous, the President is appointed by MOHA and its use of funds must be approved by MOHA. In agreement with MOHA, a road safety expert will be made available under the project to assist the Association in the review and analysis of traffic accident data and in the preparation of a program for the reduction of traffic accidents in Korea (para. 3.11).

D. Highway Administration

2.12 Table 2.6 shows the organizational and functional responsibilities of national and local authorities for the various classes of the road network. MOC (see Chart 1) excercises its responsibility for expressways through a public corporation, the Korea Highway Corporation (KHC) and for the national roads through its own Bureau of Public Roads (BPR). MOHA is responsible for provincial and for county roads.

2.13 KHC established in February 1969 as a semi-autonomous self-accounting corporation under the general direction of the Minister of Construction, is responsible for the construction and maintenance of 1,245 km of toll expressways, and ancillary facilities. Planning is done by the BPR (para. 2.19). The organization, shown on Chart 2, levies tolls, subject to review by EPB and agreement by Government. KHC is technically fully competent and the expressways are well maintained as it has ample resources of staff, equipment and funds from the tolls collected.

2.14 The BPR in MOC (Chart 3) is satisfactory in carrying out its functions in regard to national roads. It has four divisions at headquarters dealing with planning, construction, maintenance and administration, nine Territorial Construction and Management Offices (TCMOS) and 19 National Highway Maintenance Offices (NHMOS). The BPR organization has evolved with the aid of technical assistance and training provided by the Bank under four previous highways projects.

2.15 MOHA was not directly involved in highway management until recently. A Road Development Section was set up in September 1979 to be responsible for preparing and monitoring provincial and county road maintenance and the development of the county road network. Presently, with only four professional engineers, it is understaffed and does not have the manpower resources to carry out its functions effectively, particularly in view of the expanding county road development program and the major maintenance programs to be implemented from 1983 onwards. The present organization of MOHA is shown in Chart 4. Chart 5 shows the proposed MOHA organization for road management. A typical provincial road organization is shown in Chart 6 and a typical organization for the 139 counties is shown in Chart 7.

2.16 To handle the implementation of the proposed project and the increased programs at county and provincial level, certain organizational changes are needed at the center as well as staff increases at central,

provincial and county levels. By June 1985, a Road Management Division will be set up at central MOHA level, under the Bureau of Local Finance. This Division will absorb the existing Road Development Section and the Road Management Section established in October 1982 and get one new section for Road Maintenance, to be set up by April 1983, to carry out the functions detailed on Chart 5. The present engineering staff will be increased to eight and the administrative staff strengthened. No difficulties are foreseen in recruiting staff but overseas training will be provided in the project for the specialized skills of road development planning, financial management and accounting, equipment management and transport economics. During negotiations, agreement was reached with Government on a time schedule for the establishment of the Road Management Division and the new Section.

2.17 At the provincial level, about 310 officials are presently employed in the Road Divisions, Construction Offices and Heavy Equipment Offices in the nine provinces. Of this total, about 70% are engineers, comprising 92 civil engineers in the Road Divisions, 96 civil engineers in the Construction Offices and 29 mechanical engineers in the Heavy Equipment Office. An increase of only 20% will suffice to meet the organizational needs up to 1987 and thereafter. The additional staff will be trained by a technical assistance team included under the proposed project through seminars and on-the-job training.

2.18 At the county level, existing officials employed in the Civil Engineering Section total about 413 for the 139 counties, varying from two to seven officials per county. Practically all officials at county centers are high school graduates and deal with all public works and not exclusively roads. Assuming that about 50% of the existing officials will be available exclusively for road works, an increase of about 100% to a total of 417 officials will be needed by 1987; no difficulties are foreseen for the recruitment of the new staff. On-the-job training of county staff will also be done by the technical assistance team.

E. Highway Planning and Financing

2.19 Planning of the national road system, including expressways, is done by the Planning Division of the BPR. The Division carries out annual traffic surveys and maintains an inventory of national highways. BPR's planning capacity was strengthened under the Third Highway Project (Loan No. 1203-KO), which financed a feasibility study and detailed engineering of 715 km of high priority national and provincial roads. MOHA has little capacity at present for planning the development of the provincial and county road networks. Under the project this capacity will be built up using the screening and selection methodologies prepared by consultants financed under the Fourth Highway Project (Loan No. 1640-KO) and by training selected MOHA staff in road development planning and transport economics. Also under the proposed project a mechanism will be set up to ensure in the future that the various levels of the road system will be planned in a coordinated manner (para. 3.11).

2.20 In the past, MOF budget allocations to MOHA averaged about 11.5% of total domestic revenues. Under new legislation from 1983, MOHA will receive a block grant amounting to 13.27% of estimated domestic revenues with adjustments made in the following year based on the actual revenues received. Apart from the 10% of this block grant reserved for special projects, MOHA will distribute funds to the provinces, cities and counties. Thus, EPB or the Ministry of Finance (MOF) will not in the future be concerned directly with investments for county roads. This will further increase the need for improved coordination in the planning of national, provincial and county roads. The amount of the block grant to MOHA for 1983 is estimated at W 791.4 billion compared to W 719.0 billion received in 1982. In addition, the provinces raise revenues through local taxes and receive subsidies from MOC mainly for the maintenance of national gravel roads.

2.21 The total capital and recurrent expenditures planned for the FFYP, 1982-86, for the national, provincial, county and city roads and expressed in 1980 prices amount to W 1,770 billion or about US$3.0 billion and are 25% higher than the W 1,420 billion spent in 1977-81 (Tables 2.7 and 2.8). The actual expenditures during the first four plans in current prices are given in Table 2.9. After adjustments based on a reasonable assumption of yearly expenditure and variations in wholesale price index, these road expenditures expressed in constant 1975 prices totalled about W 300 billion 1967-71, W 350 billion 1972-76 and W 415 billion in 1977-81. The FFYP road investment program appears very reasonable in view of forecast traffic increases of 40% and 27% in freight ton-km and passenger-km respectively. Such increases in investment imply significant productivity gains in road transport. A comparable increase in capacity was achieved during the Fourth Plan with expenditures that were about 20% higher than the Third Plan.

2.22 The proposed road expenditures in the FFYP reflect a policy aiming at more balanced investments between the national roads, for which about 50% of total road expenditures has been earmarked, and the development of the provincial, county, city and special city road networks. This is a marked shift from previous plans where more than 70% was spent on national roads including expressways. The share for maintenance of national roads has been increased to 15% of the expenditure on those roads, an increase from the 11%, 6% and 2% spent respectively during the Fourth, Third and Second plans. However, 57% of all maintenance expenditures in 1981 by MOC was spent by KHC on its network of 1,245 km, and the balance spent on the 12,000 km national road network (Table 2.10). This imbalance can be explained partly by the higher traffic and standard of KHC expressways, but mainly reflects the freedom of KHC to dispose of the funds collected through tolls. Past MOHA allocations for maintenance have been inadequate. This problem of coordinating the level of expenditures with the actual needs on the various road networks is being addressed under the project (para. 3.11).

2.23 Road user charges are closely in line with road expenditures. Between 1977 and 1980, revenues reached W 1,306 billion versus expenditures of W 1,369 billion (Table 2.11). However, there is a strong imbalance of contribution among users; commercial vehicles making most damage to the network are those contributing least. Taxation is particularly high on private cars, the main taxes being on acquisition - over 50% of the ex-factory price -, and usage - about 35-40% of "on the road" value - which amount for a small car to about W 1,200,000 (US$1,775) in 1981. Taxes on heavy vehicles are more moderate, amounting to about 10% of total operating costs for trucks and buses used by common carriers, but are more substantial for those used by private owners. There is no axle-load tax. In addition, taxes on gasoline, add up to around 150% of the ex-refinery price, while diesel fuel is taxed at only 20% (Table 2.12).

F. Design and Construction

2.24 MOC, through the BPR, has the responsibility for planning and design of national roads including expressways and those provincial roads whose construction is to be funded by MOF or external sources. Consultants are employed for the design of major road works and work in a study group system comprising seconded BPR staff and the consultants. The design of smaller road works is usually done through the Regional Construction Offices. Supervision of construction is also done by consultants in collaboration with the Regional Construction Offices. MOHA has only recently become involved in major road design work in connection with the county road program, and employs consultants for these major works under the same system of study groups as done by MOC. The study group system has the considerable advantage of transferring road design technology to local staff. It has been most successful with MOC staff but, because of the present shortage of engineers, it has had only limited success so far in MOHA.

2.25 Korea has a strong well developed engineering consulting industry, now totalling some 30 firms. The industry is fully competent in all aspects of engineering design but has so far only a limited capacity in areas of transport economics, preparation and implementation of road maintenance programs and supervision of construction, although this capacity is growing. The usual arrangement at present is that foreign firms provide a nucleus of key staff to assist MOC and MOHA in the overall organization and coordination of feasibility studies with particular reference to identifying alternatives and doing economic analyses. When the studies have been completed and alignments and standards selected, the detailed engineering is done almost entirely by local firms. The participation of foreign firms at that stage, and for the supervision of construction is limited to overall management and assistance with special problems. The domestic engineering consulting industry will continue to have a substantial involvement in consultant services to be provided under the proposed project (para. 3.08).

2.26 Competitive bidding is the established method for awarding contracts and international competitive bidding (ICB) is used for contracts financed by external sources and for specialized construction work. Only minor improvement works and small-scale local works are done by force account. This policy, combined with the large volume of construction works in Korea during the past ten years, has resulted in the development of a large, efficient and experienced contracting industry (para. 1.07). Because of the strong domestic contracting industry, foreign contractors have not been successful in obtaining work in Korea, although some have been prequalified during the international bidding procedures.

2.27 As a result of the past concentration on national roads and expressways, the Korean contractors have become very experienced and efficient in the construction of high quality and high cost asphaltic concrete pavements. However, they have little experience on the lower cost double bituminous surface treatment (DBST) pavements which is often more appropriate for the development of the tertiary network with generally lower traffic volumes. In keeping with government policy of adopting least cost solutions to transport problems, a shift to DBST pavements instead of asphaltic concrete pavements would be supported under the project. The use of DBST surfacing has considerable advantages in Korea. Potential cost savings are substantial. Assuming that the 10,000 km gravel network of county roads would be paved eventually, a saving of the order of W 100.0 billion could result from a move to DBST paving. Substantial saving in foreign exchange would also result. Furthermore, the use of DBST paving is more suited to the adoption of a stage development approach. Maintenance is also relatively simpler and the use of less sophisticated equipment allows the participation of small local contractors. To promote such a shift, the proposed project will include an on-site training program for Korean contractors, as well as engineers from MOC and MOHA, in the use of DBST pavements (para. 3.10).

G. Maintenance

2.28 KHC is maintaining the expressway network to a high standard. It has an effective maintenance organization with four Regional Offices and 19 Field Maintenance Offices, each of the latter responsible for 50 to 70 km of expressway. The organization has well-trained and experienced staff, a large number of maintenance equipment units and adequate funding from tolls.

2.29 MOC's organization to maintain the national road network was established and strengthened during previous highway projects through the provision of technical assistance and road maintenance equipment and is now satisfactory. However, the actual budget allocations for maintenance work during the late 1970s were below the targets agreed with Government under previous highway projects. Following discussions between Government and the Bank, the Government increased its provision to 72% of the estimated requirement for 1979-81; this was accepted by the Bank due to severe budgetary constraints in Korea. Maintenance allocations for 1982 are satisfactory and comply with agreements under the Fourth Highway Project.

2.30 MOHA maintenance organizations at central, provincial and county levels are particularly weak; no proper planning of work is done and the maintenance techniques used are inadequate due to lack of trained staff, equipment and materials. As a consequence, the condition of the provincial and county gravel roads is generally poor with some roads barely passable by car. Little regravelling work has been done and what little has been done is unsatisfactory. Grading of gravel surface is difficult because of the poor material used and when done makes very little improvement to the riding quality. A survey of the paved provincial and county road networks done during 1980 showed that about 50% of both networks required heavy patching or resurfacing compared with a normal 15% to 20% for a properly built and well maintained paved road network. To address the problem, the Government, with Bank assistance under Loan 1640-KO Fourth Highway Project, has had consultants, (BCEOM, France), prepare a five-year 1983-87 maintenance program for the provincial and county road networks. The program will enable MOHA to establish, by 1987, effective organizations at central, provincial and county levels to carry out the routine and periodic maintenance of both networks. The project will assist by providing technical assistance and training and road maintenance equipment (para. 3.07).

I. Previous Bank-Financed Highway Projects

2.31 Results of the three highway projects that have been completed are generally very satisfactory. A Project Performance Audit Report (PPAR) on the First Highway Project (Loan 769-KO), including the Transport Technical Assistance Credit (S4-KO) for preinvestment studies and on the Second Highway Project (Loan 956-KO) was issued on June 25, 1980. The PPAR found that the physical components were completed ahead of schedule, with only slight cost increases, but with quality defects on some roads resulting from rapid execution needing correction after completion. Delays occurred in the implementation of legislative and administrative requirements for setting up the road maintenance organization and also occurred in the selection of candidates for training overseas. Improvements expected in transport planning and coordination were less successful than anticipated. The re-estimated economic rates of return (ERR) for the construction components exceeded appraisal estimates; 34% against 28% for the First Highway Project; and 30% against 26% for the Second Highway Project. The maintenance component included in the second project showed an audit return of 38% versus the appraisal estimate of 53%; this reduction was mainly due to delays in implementation and the consequent partial effectiveness of the program. The PPAR stressed the substantial contributions of the Bank supervision missions to the establishment of the BPR.

2.32 A Project Completion Report (PCR) on the Third Highway Project (Loan 1203-KO) was issued on April 30, 1982. The PCR found that the civil works were completed on schedule with a cost increase of slightly more than 1%. The re-estimated ERRs for the project roads ranging from 15% to 53% exceeded the appraisal estimates of 12% to 35% due mainly to the rapid increases in actual traffic volumes. The project provided assistance in the

future development of the national and provincial road network through a study which screened and ranked in order of economic priority the roads in the national and provincial road system. A major policy achievement was the formulation of Government policy on tolls through a Toll Road Study carried out under the project.

2.33 Following increased budget allocations, progress is highly satisfactory at prsent under the fourth ongoing project, which is expected to be completed in mid-1983.

III. THE PROJECT

A. Objectives

3.01 The major objective of the project will be to support Government's policy of promoting economic development in rural areas by the reduction of transport costs through the improvement of the county or tertiary road network. Also included is the setting up of organizations at central and local levels for the maintenance of provincial and county roads. With agriculture steadily becoming more commercialized and diversified, transport costs and quality of service are becoming increasingly important in order to serve the heavier two-way flow of commodities and goods between urban and rural areas. Moreover, given the high cost of domestic agricultural produce relative to import costs, the rural sector needs to be made as efficient as possible to reduce the burden on the Government and on urban consumers. Finally, the promotion of off-farm income opportunities for the rural population requires inexpensive access to secondary urban centers.

3.02 The recent improvement of the primary and secondary road networks, assisted by the Bank through four highway projects (para. 1.10), has substantially reduced transport costs and has contributed to the overall increase in production and productivity. In addition, the improvement of the village and farm access roads under the rural development programs of the early 1970s, connected the agricultural production centers to the road network. This too has been supported by the Bank through two Rural Infrastructure projects. However, the tertiary or county road network linking county centers and main villages to the secondary and primary network was neglected. Those roads have remained unimproved and their condition has deteriorated due to the increased traffic and lack of proper maintenance. They, therefore, constitute a major constraint to the development needs of the rural areas where agriculture, the primary activity, still employs 34% of the country's work force. Accordingly, the Government has given high priority in the FFYP to improvement of the county road system.

3.03 Over the next five years, the Government has planned to invest over W 330 billion or US$460 million for improving some 2,300 km of county roads and over W 180 billion or US$250 million for the setting up and operation of a maintenance organization for the county and provincial roads totalling

22,000 km. The proposed project will assist Government in carrying out the first phase of MOHA's overall program. The project would also promote improved integration of the planning of the road system by carrying out a review of road investment plans to ensure that county road development is coordinated with the development of the national and provincial road networks. It would promote the adoption of low-cost paving techniques, DBST, and train local contractors and engineers in its use. Other important objectives are to train MOHA staff in road planning and coordination, transport economics, equipment management, financial management, and accounting, and to help Government improve road safety and improve transport services in remote areas. In helping to achieve these objectives the project is a logical extension of the previous four highway projects.

B. Description

3.04 The project would consist of:

(a) improvement of about 1,000 km of provincial county roads of which about 820 km will be paved and the remainder gravel surfaced;

(b) assist in setting up and providing equipment for organizations of central provincial and country adiministrative levels to implement a maintenance programm;

(c) consultant services for:

(i) supervision of county road improvement works;

(ii) technical assistance for the provincial and county road maintenance program;

(iii) detailed engineering of an additional 1,000 km of county roads;

(iv) assistance in the implementation of an on-site training program for Korean contractors, MOHA and MOC staff in the use of double bituminous surface treatment (DBST);

(v) a study for the integrated investment planning of the road system; and

(vi) a road safety study.

(d) provision of overseas fellowships for the training of MOHA staff in road planning and coordination, economic analyses, equipment management and financial management and accounting.

Improvement of County Roads

3.05 The selection of the county roads to be financed under the project results from a screening analysis carried out by Consultants (BCEOM, France) and local consultants, as part of the County Road Development Study financed under the Fourth Highway Project, Loan 1640-KO. The study was conducted in two stages from September 1979 to February 1981. The first stage mainly screened the 12,500 km of the county road network to outline a long-range improvement program and to identify a set of priority roads for further investigation. The second stage refined the screening criteria and procedures and analyzed in more detail a total of 2,900 km; the criteria used were first-year benefit cost ratios, based on traffic and estimated construction costs, the road functions and regional balance. The final study report recommended that about 2,000 km be included in the FFYP. Detailed engineering studies for the package of 1,000 km included in this project were carried out from September 1981 to September 1982 and financed under the Fourth Highway Project; an economic evaluation, also done at this time, established the roads' economic feasibility at the standards proposed. Detailed engineering for an additional 1,000 km of county roads is included in the proposed project.

3.06 The proposed roads are located in 80 of the 139 counties and are distributed throughout all nine provinces. The roads proposed for improvement, road length, design standard, paving type, traffic and provincial distribution are shown in Table 3.1. Present traffic on the roads is relatively heavy for a tertiary network and ranges from 50 ADT to 1,200 ADT; since appraisal about 300 km of the roads proposed for improvement have been reclassified as provincical roads. The design standards for county roads are shown in Table 3.2. Existing alignments will be used to the extent compatible with sound engineering and road safety. Existing bridges will also be used but strengthened where necessary. The improvement works cover road widening, improved drainage and new pavement construction. Where warranted, the pavement will be paved with asphaltic concrete or a double bituminous surface treatment (DBST); at present it is estimated that about 820 km will be paved and the remainder gravel surfaced. Agreements on the road standards and paving type for the various segments were reached with Government at negotiations.

Provincial and County Road Maintenance

3.07 To address the problem of the rapidly deteriorating condition of provincial and county roads MOHA, in late 1979, employed consultants (BCEOM, France and Saman, Korea) financed under the Fourth Highway Project, to prepare a five-year maintenance program (1983-87) for the roads (para. 2.29). Details of the comprehensive 5-year program are given in Table 3.3 for projected physical output and in Table 3.4 for related expenditures. MOHA has generally accepted the recommendations of the study and fully agrees with the basic objective which is to have effective maintenance organizations in place at central and local levels by 1987. In order to

test the new organizational functions, systems and operational techniques, the program will be introduced initially on a pilot basis for the full program in three of the nine provinces, Gangweon, Jeonnam and Gyeongbug and for the paved network in the remaining provinces. The physical work targets for the maintenance program in the pilot provinces are shown in Table 3.5 and corresponding expenditures are shown in Table 3.6. Some 50% of the maintenance work will be done in 1983 and 1984, some 75% in 1985 and from 1986 the full program will be implemented. Evaluation of the pilot program will be done continuously and the organizational functions, systems and operational techniques will be reviewed before adopting them in the remaining provinces. The Bank will finance (a) provision of technical assistance and on-the-job training with emphasis initially on Central MOHA and the pilot provinces; (b) procurement of road maintenance equipment for the program (Table 3.7) and (c) overseas training fellowships for MOHA staff.

Consultant Services

3.08 A total of some 1,070 man-months of consultant services is estimated to be needed under the proposed project; about 800 man-months will be provided by local consultants and the balance of 270 man-months by expatriate consultants. Local consulting expertise and experience will be used to the extent possible (para. 2.25). The supervision of the county road improvement works will be done mainly by local staff supported by a number of key staff provided by foreign consultants; it is estimated that some 300 man-months of local staff and about 150 man-months of expatriate staff will be required. Local consultants will provide about 500 man-months for the design of the additional 1,000 km of county roads in preparation for the next phase of the county road development program, again assisted by a small number of key staff provided by foreign consultants for which some 28 man-months would be needed to coordinate the work and ensure that least cost design solutions are adopted.

3.09 About 65 man-months of expatriate consultant staff will be needed to help support in the implementation of MOHA's maintenance program, centrally and in the provinces. This work would comprise the preparation and introduction of the road management functions concerning planning, feasibility studies, improved maintenance operational techniques, contract management, financial management and accounting, cost control, and equipment management, including the setting up of an equipment fund for repair and replacement of equipment. The consultants will be provided with counterpart staff to ensure the transfer of technology. The technical assistance team would consist of four staff: an Economist Planner, a Management and Accounting expert, a Highway/Maintenance Engineer, and a Mechanical Engineer/Equipment Management Specialist.

3.10 Because of the lack of experience in Korea with DBST and the consequent reluctance of engineers and contractors to adopt such technology (para. 2.27), a comprehensive on-site training program in the use of DBST will be included in the project. A number of the county roads prposed for paving,

representing different terrain type and climatic conditions, will be selected and used as demonstration sites for the applicaton of DBST paving in accordance with detailed specifications. Contractors' equipment will be used and contractors' staff and engineers from MOHA and MOC will be trained in the execution of the work and in the supervision and quality control of the work. Under the proposed project an expatriate expert in DBST paving will be made available for a period of about 12 man-months to prepare the demonstration training program and related specifications and to supervise the actual demonstration and control the work on site.

3.11 In order to ensure that future development of the national, provincial and county roads proceeds on a coordinated basis, the road investment plans of MOC, KHC and MOHA will be reviewed by a study to be performed under the overall management of the BPR Planning Division. An expatriate transport economist will assist in carrying out the study. Existing and projected traffic flows would be analyzed to determine the interrelationships among the systems. The study should reduce the possibility of redundancy and contribute to greater efficiency of road investment and would be completed in about one year. A committee of representatives of MOHA, KHC and EPB, under the overall management of MOC, meeting as a group, would supervise the study and would contribute to institutionalizing balanced road development. Establishment of the committee was agreed with Government during negotiations. About 4 man-months of services by a road safety expert will be provided to the Road Traffic Safety Association to review traffic accident data, advise on improved data collection, assist in the analysis of data and help formulate policies that would help the Association reduce the present high rate of road accidents.

3.12 Draft Terms of Reference for the consulting services were agreed during negotations. All consultants will be employed under terms and conditions acceptable to the Bank.

Overseas Training Fellowships

3.13 With its increased responsibility for the county road development and provincial and county road maintenance, MOHA will require considerable strengthening in the fields of planning and economic analysis, financial management and accounting and equipment management. About ten selected MOHA staff will receive specialiged training in institutions or highway organizations overseas for periods of up to one year. The technical assistance team (para. 3.09) will assist in the selection of suitable candidates for training and will ensure that the training program is coordinated with the manpower needs for the implementation of the above programs.

C. Cost Estimates

3.14 The cost of the project, including physical, price contingencies and right-of-way costs, is estimated at US$259.70 million, with a foreign exchange component of US$134.09 million or about 52%. A summary of project costs is given in the following table; all base costs are estimated at end 1982. Taxes and duties are estimated at about 10% on item A or Won 14.7 billion (US$19.8 million equivalent). Physical contingencies of 10% were applied to all components. Annual price escalation rates, in accordance with Bank guidelines, were applied to items A and B as follows: for local and foreign costs - 8% for 1983, 7.5% for 1984 and 7% for 1985 and 6.0% thereafter. A rate of exchange of Won 745 to the US dollar was used for the calculation of the US dollar equivalent costs.

3.15 The cost estimates for the improvement of the 1,000 km of provincial and county roads are based on detailed engineering prepared by consultants, BCEOM (France) in collaboration with six domestic consultants. Unit prices are based on those for similar work items for road works under the Fourth Highway Project adjusted to reflect increases estimated to end 1982.

3.16 The base cost per kilometer of the county road improvements averages US$154,600. While the design standards used are reasonable for the projected traffic volumes, costs are high for this class of road, reflecting in part the substantial cost escalation in civil works in Korea in recent years and in part the generally difficult terrain and need for frost-resistant pavement. The foreign exchange component of the civil works, estimated at 49%, is based on construction by domestic contractors; the foreign exchange component would increase to about 52% if foreign contractors are involved. However, this is unlikely since foreign contractors have, in the past, shown little interest in bidding in Korea despite international competitive bidding (ICB) and worldwide advertising of bids.

3.17 The costs of the equipment needed for the provincial and county road maintenance program are based on prices quoted by suppliers of equipment manufactured outside Korea and adjusted to end-1982 (Table 3.7).

3.18 The costs of consultants' services for the project are based on previous contracts with consultants for similar work, taking into account the mix of expatriate and local staff in the case of the supervision and detailed engineering services. Average man-month cost of expatriate consultant staff for all services is estimated at US$12,000 including salary and overhead, international travel and local allowances. Local consultant staff man-month cost is estimated at US$2,600 including travel and allowances. Other costs include costs of vehicles including fuel and maintenance, local office facilities and utilities and local support staff.

Project Cost Summary

Project Element	W million			US$'000				
	Local	Foreign	Total	Local	Foreign	Total	% of foreign exchange	% of total base costs
A. County road improvement (1,006 km)	59,090.6	56,773.4	115,864.0	79,316.3	76,205.9	155,522.1	49.0	81.6
B. Equipment for provincial and county road maintenance program	-	20,111.0	20,111.0	-	26,994.6	26,994.6	100.0	14.2
C. Consultant Services								
Supervision of county road improvement	909.0	1,111.0	2,020.0	1,220.1	1,491.3	2,711.4	55.0	1.4
Technical assistance	780.0	520.0	1,300.0	1,047.0	698.0	1,745.0	40.0	0.9
Engineering of 1,000 km county roads	2,034.0	226.0	2,260.0	2,730.2	303.4	3,033.6	10.0	1.6
Studies - road network analysis and road safety	37.2	148.8	186.0	49.9	199.7	249.7	80.0	0.1
Contractor training	100.0	100.0	200.0	134.2	134.2	268.5	50.0	0.1
Subtotal consultant services	3,860.2	2,105.8	5,960.0	5,181.5	2,826.6	8,008.1	35.3	4.2
D. Training fellowships	22.0	88.0	110.0	29.5	118.1	147.7	80.0	0.1
Total Baseline Costs	62,972.8	79,078.2	142,051.0	84,527.3	106,145.2	190,672.5	55.7	100.0
E. Physical contingencies	6,297.3	7,907.8	14,205.1	8,452.7	10,614.5	19,067.2	55.7	10.0
Price contingencies	11,399.7	12,908.4	24,308.4	15,301.6	17,327.1	32,628.7	53.1	17.1
Total	80,669.8	99,894.7	180,564.5	108,281.6	134,086.8	242,368.4	55.3	127.1
F. Right of way	12,909.0	-	12,909.0	17,327.5	-	17,327.5		
Total Project Costs	93,578.8	99,894.7	193,473.5	125,609.1	134,086.8	259,695.9	51.6	

D. Financing

3.19 The total cost of the project, including contingencies, and right-of-way is estimated at about US$259.70 million and the foreign exchange cost at about US$134.09 million. The Bank loan of US$125 million will cover about 93% of the foreign exchange costs. In addition to the counterpart funds to meet the capital costs of the project, MOHA would provide about W 18.4 billion for 1983, W 26.7 billion for 1984 and W 35.8 billion for 1985 (Table 3.4) to meet the recurrent costs of the provincial and county road maintenance program over the three-year project period. During negotiations, it was agreed with Government that they will provide all the counterpart and recurrent funds needed to implement the project.

E. Implementation and Procurement

3.20 MOHA will be responsible for carrying out the county road development project, the provincial and county road maintenance program, and the detailed engineering for another 1,000 km of county roads to be included in the next phase of the county road improvement program. MOHA will be assisted by consultants in the bidding procedures and supervision of the county road improvement works, and in the preparation of the detailed engineering. Consultants will also provide MOHA with technical assistance to establish the organizations and procedures, including contracting of periodic maintenance, to fully implement the maintenance program initially on a pilot basis in three provinces. MOHA will carry out the training program for contractors and engineers in the use of DBST paving. MOHA will also be responsible, through the Road Traffic Safety Association for the study on road traffic accidents. MOC will be responsible for the study for the integrated investment planning of the road system, assisted by the transport economist. An implementation schedule for the project (Annex 1) was confirmed with Government during negotiations.

3.21 The road construction and improvement works, for which bid documents have been prepared and estimated to cost US$200.18 million, including contingencies, will be carried out through contracts awarded on the basis of ICB by prequalified firms in accordance with the Bank guidelines and with assistance from the consultants. Bidders will be allowed to bid for separate or groups of contracts depending on the value of works for which they are prequalified. Equipment for the maintenance program estimated to cost US$33.22 million, including contingencies, will be procured through contracts awarded after international competitive bidding, also in accordance with the Bank guidelines; foreign bids will be evaluated on the c.i.f. (point of entry) cost, and local bids on the ex-factory cost, with a margin of preference of 15%, or the import duties and taxes, whichever is lower, allowed to domestic manufacturers. Because the MOHA's lack of experience on Bank financed procurement, all bidding packages for civil works and equipment would be subject to the Bank's prior review of procurement documentation.

3.22 In line with Government policy to involve domestic contractors in maintenance work, unit price contracts for the periodic maintenance of paved provincial and county roads and for 30% of the regravelling work, all financed by local funds, will be awarded after local competitive bidding.

F. Auditing

3.23 Loan disbursements will be made against priced contracts for civil works and equipment. Interim certification of civil works completed and costed at unit rates in the contracts will be done by MOHA at central and provincial levels and the supervisory consultants. Extra works or variation orders to the contracts which would have the effect of increasing the contract amounts by more than 20% would be approved by the Bank before being issued; this was agreed with Government during negotiations. Loan disbursements for training overseas will be made against the actual costs of travel, subsistence and tuition or training fees. Disbursements against statements of expenditure will not be needed for any of the project components financed under the Loan. These procedures will facilitate the accurate auditing and accounting of the loan funds. The technical assistance team will introduce cost control systems and auditing and accounting procedures at MOHA central and local levels for all expenditures made for force account work on routine and periodic maintenance to be done by MOHA forces.

3.24 MOHA accounts are audited each year internally and also externally by the Government Board of Inspection and Audit which can be considered an independent auditing body. During negotiations, agreement was reached with Government that the audited accounts prepared by the Board of Inspection and Audit will be sent to the Bank for review within six months of the close of the fiscal year.

G. Progress Reporting and Monitoring

3.25 Agreement was confirmed with Government during negotiations on the progress report and monitoring requirements for the project. Table 3.3 through 3.6 give the targets in physical and financial terms for the maintenance program and progress will be reported against these targets. Annex 2 gives details of Project Monitoring Indices. Agreement was also reached with Government during negotiations on the preparation and submission by Government of a Project Completion Report not later than six months after Loan closing date.

H. Environment and Urban Aspects

3.26 The road improvement works will not cause any significant environmental problem. By following the existing road alignments to the extent technically and economically possible, the acquisition of land, particularly

agricultural land, will be minimized. Road safety would be enhanced by the implementation of the recommendations of the road safety study and by improved alignment and the reduction of existing hazardous dust and mud by the bituminous paving. Since the roads are mainly in the rural areas, the urban aspect of the project is not significant. During negotiations the arrangement for the acquisition of land for the rights-of-way was finalized with Government.

I. Disbursements

3.27 Disbursements from the loan would be made against the following categories of expenditures:

(a) 50% of the total cost of county roads improvement;

(b) 100% of the foreign expenditures for directly imported road maintenance equipment or 100% of the local expenditures (ex-factory price) excluding identifiable taxes and duties, of locally manufactured equipment;

(c) 100% of the costs of foreign and local consulting services; and

(d) 100% of the costs of the overseas training of staff.

A Schedule of Estimated Disbursement is given in Table 3.8, and gives a comparison with the disbursement profile for Korea. The estimated disbursements generally follow the country profile except that disbursements are expected to be completed earlier since the smaller road contracts and the large contractor capacity available in Korea should ensure early completion of civil works.

IV. ECONOMIC EVALUATION

A. Improvement of County Roads

4.01 The traffic volumes on the project road sections were estimated by several counts carried out since 1978 by the counties and supplemented by a country wide traffic survey organized by MOHA in 1980. Traffic volumes were checked and adjusted on the basis of a systematic three day count organized by the consultants in December 1981. Actual traffic volumes for 1981 vary from 50 vehicles per day (vpd) up to 1,200, with an average of 400 vpd. The distribution of traffic over the 99 sections is given in Table 4.1. Traffic volumes at the opening year in 1985 were estimated on the basis of the actual traffic in 1981, adjusted by the expected traffic growth and by traffic likely to be generated by the road improvements. Generated traffic, estimated in relation to the traffic elasticity selected for each type of vehicle, is expected to increase normal traffic by about 40% after opening of the roads. The traffic growth rates selected over the 20-year life

period of the project reflect the road functions and general economic trends. Five percent growth rate per annum was used for local interest roads serving remote areas, and 8% p.a. was used for roads bearing substantial through traffic. Intermediate rates were used for roads with both functions. A 9% p.a. growth rate was used for roads close to cities where faster growth could be expected. Moreover, to reflect changes in traffic composition, growth rates were adjusted for type of vehicle. Typical traffic composition and growth rates are given in Table 4.2. Diverted traffic was also allowed for in relevant cases.

4.02 The main benefits obtained from the improvement of the county roads are substantial savings in vehicle operating costs (VOCs) accruing to road users. Without the project, the already high VOCs would increase further with the growth of traffic. As a percentage of existing VOCs, savings vary from a minimum of 25% up to a maximum of 45%. Typical values of VOCs for different class of road standards are given in Table 4.3; they include time value for drivers of all vehicles except for private cars.

4.03 Other benefits include a reduction in travel time for passengers. Value of time was estimated at W 500 per hour for private cars and taxi passengers and at W 300 per hour for bus passengers. Average occupancy ratios were estimated at 3 passengers for cars, 2 for taxis and 30 for buses. The time value per vehicle/km range from W 50-125 for a private car, from W 33-83 for a taxi and W 300-750 for a bus, depending on the speed of vehicles. Total savings in travel time due to the paving of an earth road average about 55% of passengers time value but only about 15% of the total VOC savings.

4.04 The economic rates of return (ERR) for the county roads, calculated with and without time savings, range from 15% to over 50% (Tables 3.1 and 4.4). Overall, the ERR for the county roads, which account for 80% of the total project cost, is 30% with and 28% without time savings. For the typical road, total benefits from improvement and paving would be distributed by vehicle category as follows: over 50% to trucks, about 30% to buses and 10% each to cars and taxis. The distribution reflects the existing traffic composition of 60% of heavy vehicles. During the service life of the project, light traffic, including motorcycles, is expected to gradually increase its share of the benefits. Nevertheless, after 20 years, trucks and buses would still account for about 70% of the benefits.

4.05 The new paved roads will improve road safety by eliminating the hazardous conditions caused by dust and mud. The construction and paving work will create employment for about 4,000 workers over a 30-month period; about 60% will be unskilled labor that can be recruited locally. The introduction of unscheduled transport services on an experimental basis will contribute to more frequent and inexpensive transport, particularly for people in remote areas having no access to motorized transportation.

B. Provincial and County Roads Maintenance Program

4.06 The present project will assist MOHA to strengthen the maintenance system for the provincial and county roads network totalling 22,000 km. Improved road maintenance will not only reduce VOCs but help to preserve newly paved roads. The main cost components of the maintenance program are the recurrent expenditures and the capital outlay for equipment, technical assistance and training. The economic assessment is based on expenditures planned in the Five-Year Maintenance Program, including both capital and recurrent costs.

4.07 The benefits will accrue gradually as the program is fully implemented, and have been accounted over eight years, from 1985 to 1992, the assumed average service life of the equipment. The quantified benefits include only savings in VOCs which are estimated to range from 17% for gravel roads to 10% for paved roads. Traffic growth rates have been assumed at 7% for provincial roads and 5% for county roads. Basic data used in the calculation of transportation costs savings with and without the program are given in Table 4.5. Based on the most probable estimates of maintenance and rehabilitation costs, including a sizeable increase in recurrent costs, and benefits from VOCs savings on gravel and paved roads, the maintenance program is expected to yield an ERR of 92%. Detailed streams of costs and benefits are given in Table 4.6.

C. Risk and Sensitivity Analysis

4.08 The county road improvement component of the project is not subject to unusual risks with respect to execution and essentially consists of similar works already executed by MOHA. The introduction of DBST is a manageable risk that the training program for contractors will reduce considerably. Cost estimates have been based on detailed engineering and on the experience of MOC and the consultants with recent similar works. In the Fourth Highway Project construction component, scheduled for completion in June 1983, the cost increases, excluding price escalation, are presently expected to be of the order of 20%. Assuming no time savings, a 25% increase in construction costs and a 25% decrease in benefits, the overall ERR for the county roads improvement would decrease but would remain a very satisfactory 19%, considerably above the opportunity cost of capital, estimated at 12% in Korea (Table 4.4).

4.09 Because of the institutional, procedural and training problems related to the setting up of a new more effective organization for the maintenance of the provincial and county roads, some cost increase and decrease in benefits may be judged more likely, although these should be minimized with the help of the technical assistance team. Assuming a 20% cost increase in maintenance expenditures combined with a reduction of 25% in expected

benefits, which is a rather conservative assumption, the ERR would decrease to about 51%. The economic justification of the maintenance program would not be impaired (Table 4.6).

V. AGREEMENTS AND RECOMMENDATIONS

5.01 During loan negotiations, agreements were reached with Government that:

(a) a plan for the introduction of unscheduled transport services in a certain pilot area and for monitoring the response to such services would be implemented by September 30, 1983 (para. 2.08);

(b) a Road Maintenance Section would be established in MOHA by April 30, 1983, and that a Road Management Division would be established in MOHA by June 30, 1985 (para. 2.16);

(c) the design standards and paving type for the roads to be included in the project were acceptable (para. 3.06);

(d) a committee would be established for the study of integrated road investment planning (para. 3.11);

(e) consultants would be employed under the terms of reference and on terms and conditions acceptable to the Government and the Bank (para. 3.12);

(f) the counterpart and recurrent funds needed for the implementation of the project would be provided (para. 3.19);

(g) Bank approval would be sought for proposed variation of extra works orders to county road contracts when such variation or extra work orders would increase the contract amounts by more than 20% (para. 3.23); and

(h) that independent auditors will audit the expenditures in respect of the project and will submit to the Bank the audited accounts within six months of the end of the fiscal year (para. 3.24).

5.02 During loan negotiations understandings were reached with Government on:

(a) an implementation schedule for the project (para. 3.20);

(b) progress reporting and project monioring requirements and on the submmission of a Project Completion Report (para. 3.25); and

(c) a time-schedule for the acquisition of the right-of-way (para. 3.26).

5.03 The project is suitable for a Bank Loan of US$125 million (representing about 48% of the total cost) for a period of about 15 years with a grace period of 3 years.

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Growth Trend of Domestic Passenger Traffic (1961-81)
(Units: 1,000 passengers; million pass-km)

	1961		1966		1962-66	1971		1967-71	1976		1972-76	1981		1977-81
	Traffic volume	% share	traffic volume	% share	% increase	Traffic volume	% share	% increase	Traffic volume	% share	% increase	Traffic volume	% share	% increase
Passenger														
Rail														
Rail intercity	88,291	13.0	138,299	8.3	9.4	128,159	4.1	(1.5)	144,859	2.7	2.5			
Seoul suburban	N.A.	-	N.A.	-	-	N.A.	-	-	103,840	2.0	-			
Subtotal	88,291	13.0	138,299	8.3	9.4	128,159	4.1	(1.5)	248,699	4.7	14.2	470,754	5.2	13.6
Subway	-	-	-	-	-	-	-	-	33,914	0.6	-	102,200	1.1	24.7
Highway														
Intercity	N.A.	-	272,313	16.4	-	339,886	10.7	4.5	651,624	12.2	13.5			
Urban	N.A.	-	1,239,245	74.9	-	2,684,343	85.0	16.5	4,399,359	82.4	10.5			
Subtotal	586,864	86.4	1,511,558	91.3	20.8	3,024,229	95.7	14.9	5,050,983	94.6	10.8	8,525,291	93.6	11.0
Maritime	3,743	0.6	5,909	0.4	9.6	6,371	0.2	1.5	5,994	0.1	(1.2)	9,006	0.1	8.5
Aviation	62	-	192	-	34.1	1,105	-	44.8	795	-	(5.6)	1,629	-	15.4
Total	678,960	100.0	1,655,958	100.0	19.5	3,159,864	100.0	13.8	5,340,385	100.0	11.1	9,108,880	100.0	11.3
Pass-km														
Rail														
Rail intercity	5,372	53.0	8,665	42.5	10.0	8,750	27.1	0.8	12,441	21.2	7.3			
Seoul suburban	N.A.	-	N.A.	-	-	N.A.	-	-	1,864	3.2	-			
Subtotal	5,372	53.0	8,665	42.5	10.0	8,750	27.1	0.8	14,305	24.4	10.3	23,401	24.9	10.3
Subway	-	-	-	-	-	-	-	-	388	0.7	-	1,362	1.4	28.5
Highway														
Intercity	N.A.	-	N.A.	-	-	11,937	37.0	-	25,030	42.7	16.0			
Urban	N.A.	-	N.A.	-	-	10,980	34.1	-	18,369	31.3	10.7			
Subtotal	4,618	45.5	11,464	56.2	19.9	22,917	71.1	14.9	43,399	74.0	13.6	68,247	72.6	9.5
Maritime	136	1.3	196	1.0	7.8	256	0.8	5.5	249	0.4	(0.6)	426	0.5	11.3
Aviation	18	0.2	55	0.3	43.7	314	1.0	41.7	276	0.5	(2.5)	587	0.6	16.3
Total	10,144	100.0	20,380	100.0	15.0	32,237	100.0	9.6	58,617	100.0	12.7	94,023	100.0	9.9

Sources: Fifth Five-Year Economic and Social Development Plan, Transportation Sector Plan (1982-86), 1981, Transportation Sector Planning Task Force, MOT, Korea, pp. 2-3. Statistical Yearbook of Transportation - 1981, MOT, Korea, pp. 16-17, pp. 60-63, pp. 110-113. Statistical Yearbook of Transportation - 1973, MOT, Korea, pp. 76-77.

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KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Growth Trend of Domestic Freight Traffic (1961-81)
(Units: 1,000 tons; million tons-km)

	1961		1966		1962-66	1971		1967-71	1976		1972-76	1981		1977-81
	Traffic volume	% share	traffic volume	% share	% increase	Traffic volume	% share	% increase	Traffic volume	% share	% increase	Traffic volume	% share	% increase
Tonnage														
Railway	15,373	47.9	24,064	46.9	9.4	31,955	25.1	5.9	43,629	17.8	6.7	51,225	28.1	3.3
Highway														
Commercial	N.A.	-	N.A.	-	-	73,934	58.0	-	93,751	38.1	4.9			
Private & gov't.	N.A.	-	N.A.	-	-	10,320	8.1	-	94,439	38.5	55.7			
Subtotal	15,299	47.6	24,528	47.8	9.9	84,254	66.1	28.0	188,190	76.6	17.5	110,826	60.8	(10.0)
Maritime	1,442	4.5	2,686	5.3	13.2	11,263	8.8	34.2	13,829	5.6	5.3	20,215	11.1	7.9
Aviation	-	-	-	-	-	7	-	49.1	5	-	(5.7)	13	-	19.9
Total	32,114	100.0	51,279	100.0	9.8	127,479	100.0	18.0	245,653	100.0	5.2	182,279	100.0	3.8
Tons-km														
Railway	3,486	88.3	5,450	81.6	9.4	7,841	48.9	7.6	9,728	44.6	4.7	11,267	46.3	3.0
Highway														
Commercial	N.A.	-	N.A.	-	-	3,302	20.6	-	4,374	20.1	6.0			
Private & gov't.	N.A.	-	N.A.	-	-	237	1.5	-	2,172	9.9	55.0			
Subtotal	323	8.2	558	8.4	11.8	3,539	22.1	44.9	6,546	30.0	13.0	5,235	21.6	(4.2)
Maritime	141	3.6	672	10.0	45.2	4,653	29.0	50.2	5,533	25.4	4.1	7,815	32.1	7.2
Aviation	-	-	-	-	-	2	-	-	2	-	(2.5)	5	-	1.2
Total	3,950	100.0	6,680	100.0	11.1	16,026	100.0	18.8	21,809	100.0	4.4	24,322	100.0	4.4

Sources: Fifth Five-Year Economic and Social Development Plan, Transportation Sector Plan (1982-86), 1981, Transportation Sector Planning Task Force, MOT, Korea, pp. 2-3.

Statistical Yearbook of Transportation - 1981, MOT, Korea, pp. 111, 113, 155, 157.

Statistical Yearbook of Transportation - 1973, MOT, Korea, pp. 76-77, 101.

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PROVINCIAL AND COUNTY ROADS PROJECT

Forecast for Domestic Passenger Transport (1980-86)

Sectors	1980	% Share	Growth	1981	% Share	Growth	1982	% Share	Growth	1983	% Share	Growth	1984	% Share	Growth	1985	% Share	Growth	1986	% Share	Growth	1982-86 Average growth	1986-80 Multi-plier
Passenger ('000)																							
Total	8,544,916	100.0	5.4	9,108,880	100.0	6.6	9,864,917	100.0	8.3	10,733,029	100.0	8.8	11,634,603	100.0	8.4	12,600,275	100.0	8.3	13,633,497	100.0	8.2	8.40	1.60
Railways	430,773	5.0	1.7	470,754	5.2	9.3	523,873	5.3	11.3	585,856	5.5	11.8	650,931	5.6	11.1	721,065	5.7	10.8	793,702	5.8	10.1	11.01	1.84
Subways	65,076	0.8	(2.1)/a	102,200	1.1	37.0	113,515	1.2	11.1	181,405	1.7	59.8	363,905	3.1	100.6	805,555	6.4	121.4	962,140	7.1	19.4	56.59	14.78
Highways	8,039,006	94.1	5.6	8,525,291	93.6	6.0	9,216,447	93.4	8.1	9,954,056	92.7	8.0	10,607,368	91.2	6.6	11,060,434	87.8	4.3	11,863,642	87.0	7.3	6.83	1.48
Maritime	8,580	0.1	8.2	9,006	0.1	5.0	9,329	0.1	3.6	9,772	0.1	4.7	10,253	0.1	4.9	10,826	0.1	5.7	11,441	0.1	5.7	4.90	1.33
Aviation	1,481	-	(18.3)	1,629	-	10.0	1,753	-	7.6	1,941	-	10.7	2,146	-	10.6	2,395	-	11.6	2,672	-	11.6	10.40	1.80
Pass-km (mln.)																							
Total	87,626	100.0	2.6	94,023	100.0	7.3	101,921	100.0	8.4	110,788	100.0	8.7	120,537	100.0	8.8	130,903	100.0	8.6	141,375	100.0	8.0	8.50	1.61
Railways	21,640	24.7	1.2	23,401	24.9	8.1	25,654	25.2	9.6	28,177	25.5	9.8	31,004	22.7	10.0	33,958	25.9	9.5	36,990	26.1	8.9	9.59	1.71
Subways	926	1.1	2.4	1,362	1.4	47.1	1,517	1.5	4.4	2,227	2.0	46.8	4,084	3.4	83.4	8,162	6.2	99.9	9,745	6.9	19.4	48.22	10.52
Highways	64,131	73.1	3.3	68,247	32.6	6.4	73,669	72.3	7.9	74,210	71.5	7.5	84,172	69.8	6.3	87,391	66.8	3.8	93,115	65.9	6.5	6.41	1.45
Maritime	401	0.5	3.9	426	0.5	6.2	443	0.4	4.0	464	0.4	0.7	489	0.4	5.4	516	0.4	5.5	549	0.4	6.4	5.20	1.37
Aviation	528	0.6	(17.0)	587	0.6	11.2	638	0.6	8.7	710	0.6	11.3	788	0.7	11.0	876	0.7	11.2	976	0.7	11.4	10.70	1.85

/a Figures in brackets ( ) indicate negative growth.

Source: "Draft" for preparation of 5th Five Social and Economic Plan (Transport Sector). August 1981, MOT, Korea, p. 17.

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PROVINCIAL AND COUNTY ROADS PROJECT

Forecast for Domestic Freight Transport (1980-86)

Sectors	1980	% Share	Growth	1981	% Share	Growth	1982	% Share	Growth	1983	% Share	Growth	1984	% Share	Growth	1985	% Share	Growth	1986	% Share	Growth	1982-86 Average growth	1986-80 Multiplier
Tons ('000)																							
Total	172,776.8	100.0	(18.4) /a	182,279.4	100.0	5.5	194,856.0	100.0	6.9	208,691.3	100.0	7.1	223,717.4	100.0	7.2	240,048.7	100.0	7.3	257,812.0	100.0	7.4	7.18	1.49
Railways	49,008.0	28.4	(3.7)	51,225.0	28.1	4.5	53,680.0	27.5	4.8	56,161.0	26.9	4.6	58,916.0	26.3	4.9	61,933.0	25.8	5.1	65.386.0	25.4	5.6	5.00	1.33
Highways	104,526.0	60.3	(26.1)	110,826.0	60.8	6.0	119,573.0	61.4	7.9	129,391.0	62.0	8.2	139,995.0	62.6	8.2	151,495.0	63.1	8.2	163,870.0	63.5	8.2	8.14	1.37
Maritime	19,230.0	11.1	-	20,215.0	11.1	5.1	21,589.0	11.1	6.8	23,124.0	11.1	7.1	24,790.0	11.1	7.2	26,603.0	11.1	7.3	28,537.0	11.1	7.3	7.14	1.48
Aviation	12.8	-	(7.9)	13.4	-	4.7	14.3	-	6.7	15.3	-	7.0	16.4	-	7.2	17.7	-	7.9	19.0	-	7.3	7.23	1.48
Tons-km (mln.)																							
Total	23,186.1	100.0	(8.3)	24,322.3	100.0	4.9	25,781.8	100.0	6.0	27,457.2	100.0	6.5	29,242.7	100.0	6.5	31,201.5	100.0	6.7	33,354.0	100.0	6.9	6.52	1.44
Railways	10,798.0	46.6	(2.6)	11,267.0	46.3	4.3	11,756.0	45.6	4.3	12,329.0	44.9	4.9	12,938.0	44.3	4.9	13,603.0	43.6	5.1	14,357.0	43.1	5.5	4.97	1.33
Highways	4,920.0	21.2	(36.4)	5,235.0	21.6	6.4	5,780.0	22.2	9.0	6,246.0	22.8	9.4	6,818.0	23.3	9.2	7,461.0	23.9	9.4	8,153.0	24.4	9.3	9.26	1.66
Maritime	7,463.0	32.2	(0.7)	7,815.0	32.1	4.7	8,312.0	33.2	6.4	8,876.0	32.3	6.8	9,480.0	32.3	6.8	10,100.0	52.5	6.9	10,836.0	32.5	7.0	6.75	1.45
Aviation	5.1	-	2.0	5.3	-	3.9	5.8	-	9.4	6.2	-	4.9	6.7	-	8.1	7.5	-	11.9	8.0	-	6.7	8.58	1.57

/a Figures in brackets ( ) indicate negative growth.

Source: "Draft" for preparation of 5th Five Social and Economic Plan (Transport Sector). August 1981, MOT, Korea, p. 18.

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Table 1.5

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PROVINCIAL AND COUNTY ROADS PROJECT

Comparison of Investment Plans (1977-81 and 1982-86)
(Billion won)

Transport investment	The Fourth Plan (1977-81) /a /c Investment requirements: Domestic capital	Foreign capital (US$ mln)	Total	Composition ratio (%)	The Fifth Plan (1982-86) /b Investment requirements: Domestic capital	Foreign capital (US$ mln)	Total	Composition ratio (%)
Railway	289.9 (719.0)	231.7 (574.6)	402.1 (997.2)	14.5	894.3	715.6	1,330.8	13.4
Highway	1,141.0 (2,829.7)	174.9 (433.8)	1,225.6 (3,039.5)	44.0	3,568.9	245.8	3,718.8	37.4
Road /d	373.1 (925.3)	174.9 (451.2)	457.8 (1,135.3)	16.4	1,175.0	220.8	1,309.7	13.2
Vehicles /e	741.2 (1,838.2)	- (-)	741.2 (1,838.2)	26.6	2,307.6	-	2,307.6	23.2
Others	26.6 (66.0)	- -	26.6 (66.0)	1.0	86.3	25.0	101.5	1.0
Ports and ships	557.4 (1,382.4)	902.3 (2,237.7)	994.1 (2,465.4)	35.7	1,693.2	1,576.9	2,655.1	26.7
Ships	358.8 (889.8)	773.6 (1,918.5)	733.3 (1,818.6)	26.3	1,228.6	1,365.2	2,061.4	20.7
Ports and facilities	200.6 (497.5)	128.7 (319.2)	260.8 (646.8)	9.4	464.5	211.7	593.7	6.0
Aviation	51.4 (127.5)	15.5 (38.4)	58.9 (146.1)	2.1	175.4	687.0	594.5	6.0
Subway	54.1 (134.2)	97.0 (240.6)	101.0 (250.5)	3.6	1,324.5	509.8	1,635.0	16.5
Waterway	1.9 (4.7)	- -	1.9 (4.7)	0.1	5.0	-	5.0	-
Total	2,095.7 (5,197.3)	1,421.4 (3,525.1)	2,783.6 (6,903.3)	100.0	7,661.4	3,735.0	9,939.7	100.0
Total capital expenditure	14,188.0 (35,186.2)	10,000.0 (24,800.0)	19,028.0 (47,189.4)		59,000.0	23,673.4	72,100.0	
Total transport investment as % of total capital expenditure	14.8	14.2	14.6		13.0	15.8	13.8	

/a The Fourth Plan figures are in 1975 constant value.

/b The Fifth Plan figures are in 1980 constant value.

/c The figures in parentheses indicate the 1980 constant value.

/d Including construction, repair and loan repayment of national roads only.

/e Including new vehicles additional to the fleet and replacements for scrapped vehicles.

Note: GNP deflator: 1975 = 100, 1980 = 247.9.

Sources: (1) The Fourth Five-Year Economic Development Plan (1977-81), EPB, Korea, 1976, pp. 140-141, pp. 152-153.
(2) The Fifth Economic and Social Development Five-Year Plan - Transport Part for Implementation (1982-86), MOT, Korea, October 1981, p. 51.
(3) Transport Part of the Investment Plan, EPB, Korea, October 12, 1981, pp. 17, 26, 8.

Table 2.1

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Public Roads Network, 1962-81 /a
(km)

Years	National roads /b			Provincial roads			Gun roads		
	Paved	Gravel	Total	Paved	Gravel	Total	Paved	Gravel	Total
First FYP									
1962	857	4,886	5,743	73	10,470	10,543	-	-	10,000/c
1963	863	4,947	5,810	54	11,244	11,298	-	-	n.a.
1964	963	4,936	5,899	54	11,343	11,397	-	-	n.a.
1965	1,042	4,857	5,899	71	12,267	12,338	-	-	n.a.
1966	1,349	6,837	8,186	31	10,364	10,395	-	-	n.a.
Second FYP									
1967	1,442	6,744	8,186	52	10,600	10,652	-	-	n.a.
1968	1,540	6,626	8,166	74	10,597	10,671	-	-	n.a.
1969	2,110	6,461	8,571	134	10,703	10,837	-	-	n.a.
1970	2,461	6,197	8,658	202	10,692	10,894	-	-	n.a.
1971	2,943	5,843	8,786	254	10,524	10,774	-	-	n.a.
Third FYP									
1972	3,319	5,610	8,929	283	10,517	10,800	-	-	n.a.
1973	3,868	5,419	9,287	503	10,389	10,892	-	-	n.a.
1974	4,070	5,217	9,287	639	10,250	10,889	-	-	n.a.
1975	4,748	4,612	9,360	719	10,092	10,811	-	-	n.a.
1976	4,874	4,486	9,360	811	10,057	10,868	-	-	n.a.
Fourth FYP									
1977	5,434	4,008	9,442	922	9,933	10,855	384	12,125	12,509
1978	6,200	3,257	9,457	998	9,821	10,819	442	12,061	12,503
1979	6,224	3,233	9,457	1,169	9,819	10,988	466	12,022	12,488
1980	6,772	2,685	9,457	1,385	9,636	11,021	564	11,948	12,512
1981 /d	7,571	5,864	13,435	759	8,932	9,691	546	10,933	11,479
	(56%)	(44%)	(100%)	(8%)	(92%)	(100%)	(5%)	(95%)	(100%)

/a In addition there are 15,508 km of city roads (mostly streets), 9,304 km in the special cities of Seoul, Busan, Daegu and Incheon, and 6,204 km in all cities; and also village access roads of which 52,444 km had been constructed and improved under the Seamaul Movement at the end of 1980.

/b Includes roads under the jurisdiction of KHC, totalling 1,245 km in 1981.

/c Length not available (n.a.) before 1977 as city roads were tabulated jointly with gun roads. Length of gun roads in 1962 believed to have been about 10,000 km.

/d Road networks were reclassified during the early part of 1981.

Source: Ministry of Construction.

June 1982

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Registered Motor Vehicles (1962-80)

Years	Cars /a	Trucks /b	Buses /c	Motor-cycles	Others /d	Total
First FYP						
1962	8,733	13,093	6,747	-	2,241	30,814
1963	9,569	13,929	8,132	-	2,598	34,228
1964	11,409	14,951	8,617	-	2,836	37,813
1965	13,001	16,015	9,316	-	3,179	41,511
1966	17,502	19,432	10,888	-	2,338	50,160
Second FYP						
1967	23,235	22,955	11,499	1,186	1,822	60,697
1968	33,112	31,582	12,786	1,378	2,093	80,951
1969	50,299	40,134	14,237	1,675	2,324	108,669
1970	60,677	48,901	15,831	2,711	1,251	129,371
1971	67,582	53,405	17,411	3,902	2,037	144,337
Third FYP						
1972	70,244	55,116	17,550	4,216	2,909	150,035
1973	78,334	64,584	18,871	5,407	3,518	170,714
1974	76,462	76,833	20,060	6,039	4,150	183,544
1975	84,212	82,862	21,818	6,594	5,035	200,521
1976	96,099	93,885	23,643	7,342	5,351	226,320
Fourth FYP						
1977	125,613	118,150	26,710	7,440	4,839	282,752
1978	184,886	161,886	30,597	12,020	7,167	396,556
1979	241,422	206,822	37,697	181,976	8,437	676,854
1980	249,102	226,940	42,463	216,498	9,224	744,227
Average Annual Growth (% p.a.)						
1962-67	21.7	11.9	11.3	-	-	14.5
1967-72	24.8	19.2	8.8	19.6	-	19.8
1972-77	12.3	16.4	8.8	12.0	-	13.5
1977-80	25.6	24.3	16.7	207.6	-	38.1
Fleet Composition (%)						
1962	28.3	42.5	21.8	---- 7.4 ---		-
1967	38.3	37.8	18.9	2.9	2.1	100
1972	46.8	36.9	11.7	3.8	1.8	100
1977	44.4	41.8	9.5	2.6	1.7	100
1980	33.5	30.5	5.7	29.1	1.2	100

/a Includes taxis and government vehicles (see details, Table 2.2, p. 2).
/b Includes public carriers as well as private and government-owned trucks (see details, Table 2.2 pg. 3).
/c Includes microbuses.
/d Public service and special vehicles; includes motorcycles prior to 1967.

September 1982

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Cars by Categories of Ownership (1967-80)
('000 vehicles)

Years	Government	Private	Commercial (mostly taxis)	Total
Second FYP				
1967	2.2	9.9	11.1	23.2
1968	2.8	14.4	15.9	33.1
1969	3.1	23.7	23.5	50.3
1970	3.6	28.7	28.4	60.7
1971	4.0	34.0	29.6	67.6
Third FYP				
1972	4.5	36.4	29.3	70.2
1973	5.0	43.4	29.9	78.3
1974	4.9	44.6	27.0	76.5
1975	5.0	50.1	29.1	84.2
1976	5.2	61.6	29.3	96.1
Fourth FYP				
1977	5.7	85.1	34.8	125.6
1978	6.1	128.8	50.0	184.9
1979	6.8	172.9	61.7	241.4
1980	7.8	178.5	62.8	249.1
Fleet Composition (%)				
1967	9.5	42.7	47.8	100.0
1972	6.4	51.9	41.7	100.0
1977	4.3	68.2	27.5	100.0
1980	3.1	71.7	25.2	100.0

Cars per 1,000 Population	Population (mln.)	Private ('000)	Total ('000)
1967	30.1	0.19	0.76
1972	32.5	0.55	1.64
1977	36.0	1.93	3.28
1980	37.9	4.71	6.57

Source: Ministry of Transportation.

September 1982

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Trucks by Categories of Ownership (1967-80)
('000 vehicles)

Year	Government	Private /a	Commercial /b	Total
Second FYP				
1967	2.2	5.6	15.1	23.0
1968	2.7	7.6	21.3	31.6
1969	2.8	11.0	26.3	40.1
1970	3.0	15.2	30.7	48.9
1971	3.3	18.5	31.6	5.34
Third FYP				
1972	3.6	21.5	30.0	55.1
1973	4.9	26.8	32.9	64.6
1974	4.9	45.3	36.6	76.8
1975	5.0	39.9	38.0	82.9
1976	5.9	49.4	38.6	93.9
Fourth FYP				
1977	7.3	69.5	41.4	118.2
1978	7.6	105.4	48.9	161.9
1979	8.3	146.2	52.3	206.8
1980	8.9	165.4	52.7	226.9
Fleet Composition (%)				
1967	10.0	24.3	65.7	100.0
1972	6.5	39.0	54.5	100.0
1977	6.2	58.8	35.0	100.0
1980	3.9	72.9	23.2	100.0

/a For carrying own goods.

/b Common carriers.

Source: Ministry of Transportation.

November 1981

Table 2.3

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Korean Motor Vehicle Production (1962-80)

Year	Cars	Buses	Trucks	Motor-cycles	Total
Actual					
First FYP					
1962	991	42	884	-	1,917
1963	1,430	233	143	-	1,806
1964	179	405	108	-	692
1965	166	1,251	965	-	2,382
1966	3,398	1,482	559	-	5,439
Second FYP					
1967	5,033	941	1,512	4,591	12,077
1968	11,421	1,632	5,212	16,569	34,834
1969	10,727	1,884	9,626	13,735	35,972
1970	13,636	3,690	13,032	16,242	46,600
1971	11,870	3,059	8,072	21,317	35,318
Third FYP					
1972	9,577	2,568	6,506	773	19,424
1973	12,130	3,400	10,176	13,851	39,557
1974	9,247	3,398	19,808	11,495	43,948
1975	17,862	3,837	18,168	11,666	51,533
1976	25,304	3,481	20,312	16,798	65,895
Fourth FYP					
1977	43,981	5,453	35,263	32,629	117,326
1978	86,823	7,279	63,446	70,654	228,202
1979	113,564	12,307	76,661	100,496	303,028
1980	57,225	12,053	51,660	110,773	231,711

Source: Ministry of Transportation.

September 1982

Table 2.4

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Motor Vehicle Fuel Consumption (1962-80) /a
('000 kiloliters)

Year	Gasoline	Diesel
First FYP		
1962	108	307
1963	97	358
1964	102	386
1965	223	507
1966	336	558
Second FYP		
1967	481	765
1968	573	1,251
1969	748	1,507
1970	865	1,775
1971	992	2,099
Third FYP		
1972	976	2,338
1973	1,040	2,838
1974	698	2,918
1975	664	3,328
1976	838	4,103
Fourth FYP		
1977	1,105	4,767
1978	1,258	5,558
1979	1,373	5,915
1980	1,116	6,020
Average Annual Growth (% p.a.)		
1962-67	34.8	20.0
1967-72	15.2	25.4
1972-77	2.5	15.3
1977-80	-	0.5

/a Gasoline consumption is totally for vehicles, but diesel consumption includes 20-30% of other consumption.

Source: Ministry of Commerce and Industry.

September 1982

Table 2.5

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Commercial Licensing of Road Transport Companies (1974-80)

Year	Taxis			
	Number of companies	Number of vehicles	Owner-drivers	Total taxis
1974	669	27,000	-	27,000
1976	711	28,240	860	29,100
1977	722	29,830	4,770	34,600
1980	1,517	53,590	15,960	69,550

Year	Trucks					
	Area license		Route license		Total	
	Number of companies	Trucks ('000)	Number of companies	Trucks ('000)	Number of companies	Trucks ('000)
1974	n.a.	n.a.	n.a.	n.a.	674	36.6
1976	725	37.0	32	1.6	757	38.6
1977	740	40.6	32	1.6	772	42.2
1980	948	56.9	30	1.9	978	58.8

Year	Buses							
	Intracity		Intercity /a		Charter		Total	
	Number of companies	Buses ('000)	Number of companies	Buses ('000)	Number of companies	Buses ('000)	Number of companies	Buses ('000)
1974	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	341	16.5
1976	199	9.5	144	8.7	93	1.3	436	19.5
1977	204	10.2	150	9.5	108	1.9	462	21.6
1980	n.a.	14.9	n.a.	11.7	153	2.8	650	29.4

/a Includes companies operating services on the expressways (12, 11 and 10 in 1974, 1977 and 1980).

Source: Ministry of Transportation.

September 1982

Table 2.6

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Road Authorities and Agencies

	Toll highways	National roads	Provincial roads /a	City/county (gun) roads
Planning	MOC	MOC	9 provincial construction bureaus (PCB) /b	City/county construction divisions (CCD)
Construction				
Design & supervision	MOC/Korea Highway Corp. (KHC)	MOC through its 5 regional construction offices (RCOs)	PCB /b	CCD
Financing	MOC/KHC /c	MOC	Provinces with Ministry of Home Affairs (MOHA) grants; also from MOC budget for special projects	City/county with provincial grants
Maintenance				
Execution Authority/ Agency				
Paved	KHC	NHMO /d	PCB	CCD
Unpaved	-	PCB /d	PCB	CCD
Financing	KHC	MOC	Provinces with MOHA grants	City/county with provincial grants

/a The special cities of Seoul and Busan (city construction bureaus) have functions similar to provincial authorities (provincial construction bureaus).

/b The MOC has so far handled the planning, design and supervision of construction or major improvement of a number of provincial roads, particularly those for which external financing is involved.

/c KHC was established in January 1969, but has not so far financed any construction.

/d MOC has responsibility for maintenance of all national roads; it directly maintains paved national roads through its 19 national highway maintenance offices (NHMOs) under its five regional construction offices (RCOs); it delegates maintenance of the unpaved national roads to the provincs (PCBs) with financial grants from the MOC's budget, and assistance provided by its TCMOs.

Source: Ministry of Construction.

October 1982

Table 2.7

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Fifth Five-Year Plan: Expenditures for Roads (1982-86)
(In 1980 prices)

	1982	1983	1984	1985	1986	Total W bln.	Total US$ mln. /a	Total Qty. (km)
	(W billion)							
Central Government Financing								
Construction & Improvement								
Expressways (KHC) /b	38.5	52.3	17.4	37.8	45.4	291.4	477.7	360
National Highways	99.5	101.3	65.4	133.3	153.4	552.9	906.4	-
Paving	93.4	96.4	53.4	94.4	109.9	447.5	733.6	2,421
Widening	6.1	4.9	12.0	38.9	43.5	105.4	172.8	173
Bridges (length in m)	3.9	3.7	6.8	8.4	6.2	29.0	47.5	7,591
Provincial roads paving	2.9	2.9	2.6	9.4	8.0	25.8	42.3	82
Subtotal	144.8	160.2	192.2	188.9	213.0	899.1	1,473.9	-
Others								
National highway maintenance	28.6	31.6	37.1	43.5	50.1	190.9	313.0	-
Overhead & studies	10.5	10.7	12.3	14.4	7.6	55.5	91.0	-
Loan amortization	26.4	33.1	33.3	34.7	36.7	164.2	269.1	-
Subtotal	65.5	75.4	82.7	92.6	94.4	410.6	673.1	-
Total	210.3	235.6	274.9	281.5	307.4	1,309.7	2,147.0	-
Local government financing (including maintenance) /c	91.7	91.8	91.8	91.8	91.8	458.9	752.3	2,452
GRAND TOTAL	302.0	327.4	366.7	373.3	399.2	1,768.6	2,899.3	-

/a Exchange rate 1980: US$1 = W 610.
/b Excluding maintenance expenditures of KHC.
/c Includes provinces and counties but excludes cities and special cities estimated at W 1,665 billion.

Sources: MOC and MOHA.

September 1982

Table 2.8

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Fourth Five Year Plan: Expenditures on Roads (1977-81) /a
(Won billion)

	1977	1978	1979	1980	1981	Total 1977-81	%
National & Express Highways							
Administration	9.8	12.2	16.6	24.8	35.8	99.2	5.2
Construction	80.9	70.0	105.0	117.4	181.3	554.6	28.8
Maintenance	21.0	25.7	43.4	55.5	80.6	226.2/b	11.8
Subtotal	111.7	107.9	165.0	197.7	297.7	880.0	45.8
Others							
Provincial, Gun (County) & City Roads							
Administration	0.7	0.8	1.9	2.8	2.8	9.0	0.4
Construction	44.9	32.9	51.5	92.1	56.5	277.9	14.5
Maintenance	2.6	3.1	6.1	14.6	15.5	41.9	2.2
Subtotal	48.2	36.8	59.5	109.5	74.8	328.8	17.1
Special Cities							
Administration	-	1.8	2.7	32.9	21.3	58.6	3.0
Construction	67.7	115.1	32.4	159.7	131.0	606.0	31.5
Maintenance	1.9	3.4	3.0	4.7	36.6	49.6	2.6
Subtotal	69.6	120.3	138.1	197.3	188.9	714.2	37.1
Total, Current Prices	229.5	265.0	362.6	504.5	561.4	1,923.0	100.0
Total, 1975 Prices /c	167.6	160.5	184.1	203.5	192.8	908.5	
Total, 1980 Prices /c	415.6	397.9	456.3	504.5	477.9	2,252.2	

/a Including MOC, KHC and Government.
/b Maintenance of KHC network amounted to W 128 billion or 57%.
/c GNP deflator: 1975 = 100, 1977 = 136.9, 1978 = 165.1, 1979 = 197.0, 1980 = 247.9, 1981 = 291.2.

September 1982

Table 2.9

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Expenditures on Roads (1962-1981) /a
(million won)

	Total First Plan 1962-66	%	Total Second Plan 1967-71	%	Total Third Plan 1972-76	%	Total Fourth Plan 1977-81	%
Government Expenditures on National Highways/b								
Administration	74	1	946	1	5,887	2	99,241	8.2
Construction	3,811	53	89,022	72	179,424	66	554,553	45.9
Maintenance/c	193	3	1,448	1	11,479	4	226,151	18.7
Subtotal	4.078	57	91,416	74	196,790	72	879,945	72.8
Expenditures on Provincial Gun (County), and City Roads /d /e								
Administration	-	-	-	-	-	-	8,979	0.7
Construction	2,174	31	26,286	21	65,150	24	277,984	23.0
Maintenance /f	851	12	5,737	5	11,516	4	41,930	3.5
Subtotal	3,025	43	32,023	26	76,666	28	328,898/g	27.2
Total	7,103	100	123,439	100	273,456	100	1,208,838	100

/a At current prices.
/b Includes roads under the jurisdiction of KHC.
/c Does not include funds contributed by provinces for the maintenance of national highways.
/d Seoul City excepted in First to Third Plans, and Special Cities (Seoul, Busan, Daegu and Incheon) excepted in the Fourth Plan.
/e Includes Government grants.
/f Maintenance includes expenditures on national highways, estimated up to 70% of the total but does not include the value of voluntary labor provided for all highways.
/g Investments under the Fourth Plan for the Special Cities amount to an additional W 714.2 billion and would represent 37%, if taken into account, of total road expenditures.

Source: Ministry of Construction, Ministry of Home Affairs.

September, 1982

Table 2.10

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Expenditures on Roads (1981)
(Million won)

	MOC /a	KHC /b	Local government /c	Total	%
Expressways					
Administration	-	4,178	-	4,178	
Construction	20,000	21,054	-	41,054	
Maintenance	-	41,615	-	41,615	
Total	20,000	66,847	-	86,847	15.4
National Highways					
Administration	30,691/d	-	898	31,589	
Construction	100,527	-	39,687	140,214	
Maintenance	32,596	-	6,431	39,027	
Total	163,814	-	47,016	210,830	37.5
Special City Roads /e					
Administration	-	-	21,299	21,299	
Construction	-	-	131,036	131,036	
Maintenance	-	-	36,605	36,605	
Total	-	-	188,940	188,940	33.6
Provincial Roads					
Administration	-	-	1,713	1,713	
Construction	2,719	-	26,686	29,405	
Maintenance	-	-	6,835	6,835	
Total	2,719	-	35,234	37,953	6.7
City Roads					
Administration	-	-	651	651	
Construction	-	-	14,206	14,206	
Maintenance	-	-	5,706	5,706	
Total	-	-	20,563	20,563	3.6
Gun Roads					
Administration	-	-	409	409	
Construction	-	-	12,935	12,935	
Maintenance	-	-	2,976	2,976	
Total	-	-	16,320	16,320	2.9
Total					
Administration	30,691	4,178	24,970	59,839	
Construction	123,246	21,054	224,550	368,850	
Maintenance	32,596	41,615	58,553	132,764	
Total	186,533	66,847	308,073	561,453	100

/a Ministry of Construction.
/b Korea Highway Corporation.
/c Nine provincial governments and four special cities.
/d Reimbursement cost W 24,190 million for previous loan is included.
/e Seoul, Busan, Daegu and Incheon special cities.

September, 1982

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Road User Charges (1972-81)
(W million)

Revenue	Third FYP						Fourth FYP					
	1972	1973	1974	1975	1976	1972-76	1977	1978	1979	1980	1981	1977-81
National Taxes												
Fuel taxes	27,717	36,582	83,717	95,016	114,874	357,906	133,082	120,536	210,606	362,714	356,124	1,183,062
Gasoline tax	(19,593)	(25,821)	(57,236)	(60,026)	(72,185)	(234,861)	(94,149)/a	(104,209)/a	(184,352)/a	(310,394)/a	(290,122)/a	(983,226)/a
Diesel tax	(8,124)	(10,761)	(26,481)	(34,990)	(42,689)	(123,045)	(38,933)/a	(16,327)/a	(26,254)/a	(52,320)/a	(66,002)/a	(199,836)/a
Transport tax	16,000	18,801	13,484	16,868	21,262	86,415	15,054 /b	-	-	-	-	-
Commodity tax /c	3,535	6,613	7,499	11,764	16,642	46,053	9,330 /b	28,279	35,798	20,600	19,184	128,245
Subtotal	47,252	61,996	104,700	123,648	152,778	490,374	157,466	148,815	246,404	383,314	375,308	1,311,307
Local Taxes												
Vehicle tax (incl. surcharge)	7,191	7,866	12,016	12,353	14,137	53,563	17,900	26,518	51,416	60,866	61,014	217,714
License fee /d	1,661	1,804	1,784	2,092	2,388	9,729	3,949	7,735	7,845	8,340	8,665	36,534
Acquisition tax /d	-	1,622	2,643	3,708	4,636	12,609	6,143	15,388	21,110	19,393	19,005	81,039
Subtotal	8,852	11,292	16,443	18,153	21,161	75,901	27,992	49,636	80,137	88,599	88,734	335,058
Tolls	4,995	6,276	6,887	10,189	14,531	42,878	17,915	25,608	39,242	45,411	59,585	187,761
Total	61,099	79,564	128,030	151,990	188,470	609,153	203,373	224,059	366,017	517,324	523,627	1,834,100
Overall expenditures on roads /e	68,300	68,000	83,800	149,400	145,900	515,400	229,470	265,040	362,571	504,560	561,453	1,923,054

/a Special excise tax excluding Value Added Tax (VAT).
/b These taxes were incorporated in the newly adopted Value Added Tax from July 1, 1977 when the Korean Tax system was changed.
/c Estimated 10% of total commodity tax.
/d Revenues were combined prior to 1973. Both license fee and acquisition tax figures are estimates of the portion of the revenues from these taxes attributable to road vehicles.
/e Economic Statistics Yearbook 1982, The Bank of Korea, Korea, pp. 86-87.

Sources: Ministry of Construction, Ministry of Finance, Ministry of Home Affairs.

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Table 2.12

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PROVINCIAL AND COUNTY ROADS PROJECT

Pump Price of Major Petroleum Products in Korea
(1980-82)
(Won/liter) /a

	Refinery's selling price		Agent		Service station	
	Ex-refinery price	Tax included	Fee	Price	Fee	Price
Premium gasoline	321.28	820.90 (944.04)	23.15	844.05	35.95	880 (1,010) [1,060]
Regular gasoline	249.91 (261.00) [276.00]	630.34 (660.34)	17.23	657.57	22.43	680 (700) [740]
Kerosene	180.12	202.96 (242.92)	9.30	212.26	13.74	226 (268)
Diesel	160.30 (197.00) [216.00]	193.84 (231.97)	8.90	202.03	12.97	215 (255) [286]

/a - Figures of 1980 are of November 19.
- Figures in parentheses are 1981 prices (April 18).
- Figures in brackets [ ] are 1982 prices (May 31).

Sources: MOER, and mission to Korea.

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County (Gun) Road Improvement Program

Section No.	Sub-sec.	From - to	Length (km)	Standard /a	Construction costs (W mln at April 1982 prices)	Traffic (AADT) 1981 Actual	1985 forecast	Growth rate (%)	Internal rate of return: With time/b	Without time/c	Sensitivity 1/d	2/e	3/f
1		Gyeonggi Do											
1-1		Dang Hyeon - Gung Ri	6.0	P.2*	548	490	892	8	46.5	45	40	38	31
1-2		Ha Bug - Geum An	2.6	P.1	255	195	326	6	20.9	19	18	17	12
1-3		An Seong - Seo Un	12.5	P.2*	1,762				33.3	31	28	27	21
	A		(2.0)			470	806	7					
	B		(10.5)			305	556	7					
1-4		I Cheon - Sin Dun	9.0	G.2	739	120	230	5	35.3	33	30	28	22
1-5		Yong In - Jeong Su	10.0		712				30.0	28	25	24	19
	A		(3.6)	P.2*		425	700	7					
	B		(6.4)	G.2		80	139	5					
1-6		Bal An - Sin Wang	6.6	P.1	844				29.9	28	25	24	18
	A		(3.2)			190	365	5					
	B		(3.4)			100	171	5					
1-7		So Ha - Il Jig	6.3	P.3*	1,144	250	627	9	45.4	40	39	37	28
1-9		An Gol - Gyeong Sin	11.1	P.1	954				22.6	19	19	18	12
	A		(5.1)			100	210	6					
	B		(6.0)			100	171	6					
1-11		Deog So - Weoi Mun	6.5		904				34.5	32	29	28	22
	A		(2.3)	P.3*		500	852	7					
	B		(4.2)	P.1*		170	354	7					
1-12		Jeung Mal - Bulam Gul	3.8	P.3*	623	600	1,130	9	37.4	34	32	31	24
1-13		Su Saeg - Yong Du	4.8	P.3*	863				42.6	39	37	35	27
	A		(2.4)			300	791	9					
	B		(2.4)			150	404	9					
1-14		Gimpo - Geum Dam	5.3	P.2*	742	460	731	7	20.1	19	17	16	12
1-15		Yang-Gog - Dae Myeong	7.4	P.2*	1,293	600	1,006	7	33.5	31	28	27	21
1-16		Su Cheon - Sin Ri	5.4	P.2*	875	530	794	5	22.4	20	19	18	13
1-17		Geum Chon - Mun San	9.2	P.2*	1,225				26.0	25	22	21	16
	A		(3.7)			350	569	5					
	B		(5.5)			200	340	5					
1-18		Po Cheon - Jig Du	5.0	P.2*	504	300	516	7	28.0	26	24	22	18
1-19		Ga Pyeong - Mog Dong	8.9	P.3*	917	770	1,110	5	34.7	34	29	28	22
		Subtotal	120.2		14,904								
2		Gangweon Do											
2-1		Jin Bu - Su Hang	11.4	G.2	1,066	120	231	5	28.5	27	24	23	18
2-2		Weon Ju - Go San	9.9	P.1*	1,196	225	481	7	45.7	41	39	37	28
2-3		U Du - Jung Ri	12.4		1,027				32.8	30	28	27	20
	1-A		(2.3)	P.2*		380	595	7					
	1-B		(3.2)	P.1*		110	206	6					
	1-C		(3.8)	P.1*		110	250	6					
	1-D		(2.3)	P.2*		250	570	8					
	2		(0.7)	P.2*		255	434	8					
2-4		Eui Am Dam - Sin Mae	14.3	P.2*	2,050				20.9	20	18	17	13
	A		(8.1)			180	360	7					
	B		(6.2)			60	134	6					
2-5		Song U - Im Dang	9.9	P.1	879				16.8	16	14	13	9
	A		(2.4)			345	556	6					
	B		(7.5)			190	288	6					
2-6		Do Limit - Sa Chang	11.9	P.1*	1,739				28.7	26	24	23	18
	A		(8.4)			230	508	7					
	B		(3.5)			410	620	7					
2-7		Mun Hye - Hwa Ji	16.9	P.2*	2,477				22.4	21	19	18	14
	1		(4.4)			315	508	5					
	2		(10.8)			370	620	8					
	3		(1.7)			226	375	6					
		Subtotal	86.7		10,434								

Section No.	Sub-sec.	From - to	Length (km)	Standard /a	Construction costs (W mln at April 1982 prices)	Traffic (AADT) 1981 Actual	Traffic (AADT) 1985 forecast	Growth rate (%)	Internal rate of return With time/b	Internal rate of return Without time/c	Sensitivity 1/d	Sensitivity 2/e	Sensitivity 3/f
3		Chungcheong Bug Do											
3-1		Bong Gye - Don Hwa	7.7	P.1	944	150	290	7	22.0	19	19	18	13
3-2		Tae Seong - Chu Jeom	14.5	G.2	1,149	95	152	5	16.8	14	14	13	9
3-3		Cho Pheong - Deog San	7.1	P.1	714	140	250	6	19.5	18	17	15	11
3-4		Mog Haeng - Mog Gye	12.6	G.2	880	60	112	5	17.8	16	15	14	9
3-5		Yang Chon - Dog Eun	14.6		1,318				27.3	25	23	22	17
	A		(6.2)	P.1		105	194	7					
	B		(8.4)	G.2		105	210	7					
3-6		Byeol Bang - Yu Am	11.5	P.1	1,439	90	193	6	27.0	23	23	22	15
		Subtotal	68.1		6,444								
4		Chungcheong Nam Do											
4-1		Geum An - Baeg Am	5.7	P.1*	581	260	481	8	36.1	32	31	29	22
4-2		Non San - Ga Ya Gog	8.0	P.1*	853	240	411	7	24.5	21	21	20	14
4-3		Non San - Seong Dong	8.7		767				25.8	24	22	21	16
	A		(6.0)	P.1*		230	367	6					
	B		(2.7)	P.2*		420	671	7					
4-4		Gu Am - Nae Dong	7.3		698	250	466	8	33.6	31	29	27	21
	A		(1.0)	P.3*									
	B		(6.3)	P.2*									
4-5		Ga Su Weon - Pheong Chon	11.3		1,244				34.2	30	29	28	21
	A		(1.1)	P.3*		1,220	1,748	7					
	B		(10.3)	P.1*		295	526	7					
4-6		Tan Cheon - Seog Seong	10.5	G.2	724	150	273	7	32.8	31	28	27	21
4-7		Deog San - Gal San	12.7	P.2*	1,582				43.4	41	37	35	28
	A		(4.0)			435	803	8					
	B		(8.7)			345	699	8					
4-8		Tong Po - Bag San	5.3	P.1	573	230	348	5	15.5	14	13	12	9
4-9		Cheon An - Haeng Jeong	15.5	P.1*	1,568				28.6	26	24	23	18
	A		(10.9)			300	508	8					
	B		(4.6)			110	248	7					
4-10		In Ju - Yeom Chi	13.1	G.2	861	130	211	5	23.2	20	19	18	13
4-11		Oe San - Su Sin	8.3		1,242	270	550	8	51.5	48	44	42	34
	A		(8.1)	P.2*									
	B		(0.2)	G.2									
4-12		Su Sin - Sa Yang	8.3	G.2	480	100	200	7	41.9	37	36	34	26
4-13		Ju San - Do Hwa Dam	14.8	P.3*	2,127				32.8	32	28	27	22
	A		(8.1)			360	618	8					
	B		(6.7)			130	302	8					
4-14		Hwa Yang - Seog Taeg	6.6	G.2	490	80	152	5	19.9	18	17	16	11
4-15		Sab Gyo - Gu Man	7.2	P.1	688	100	204	5	19.2	18	16	15	11
4-16		Seo San - Chang Ri	19.5	P.2*	2,731				19.0	17	16	15	11
	A		(8.4)			380	643	7					
	B		(11.1)			200	338	7					
		Subtotal	162.9		17,149								
5		Jeonra Bug Do											
5-1		Go Chang - Ban Am	13.8		1,458				30.9	28	26	25	19
	1		(6.2)	P.2*		565	921	8					
	2		(7.6)	P.1*		220	388	7					
5-2		Jeong Eub - Sin Tae In	15.4	P.2*	2,442				24.6	22	21	20	15
	A		(10.4)			370	627	7					
	B		(4.9)			185	326	7					
5-3		Geum Gwa - Pung San	10.3	G.2	755	135	217	5	23.3	20	19	18	13
5-4		Nam Weon - Song Dong	14.0	P.1	1,275				17.9	16	15	14	9
	1		(11.9)			225	350	5					
	2		(2.1)			100	165	5					
5-5		Dae Cha - Mu Ju - Nae Do	11.5	G.2	1,230				33.6	31	28	27	21
	1		(7.7)			135	307	6					
	2		(3.8)			105	200	6					
5-6		Wang Gung - Sam Rye	8.7	P.2*	832	405	706	7	38.7	35	33	31	24
		Subtotal	73.7		7,992								

Section No.	Sub-sec.	From - to	Length (km)	Standard /a	Construction costs (W mln at April 1982 prices)	Traffic (AADT) 1981 Actual	Traffic (AADT) 1985 forecast	Growth rate (%)	Internal rate of return: With time/b	Internal rate of return: Without time/c	Sensitivity 1/d	Sensitivity 2/e	Sensitivity 3/f
6		Jeonra Nam Do											
6-1		Im Gog - Song Jae	21.6		2,480				32.1	30	27	26	21
	1		(10.1)	P.1*		265	436	7					
	2-A		(7.3)	P.2*		280	491	7					
	2-B		(4.3)	P.2*		270	594	7					
6-2		Go Seo - Yeon Cheon	10.1		1,371				25.7	24	22	21	16
	A		(2.0)	P.3*		475	759	8					
	B		(8.1)	P.2*		260	461	8					
6-3		Seong Jeong - Sam Geo Ri	15.2	P.3*	2,049				29.6	28	25	24	18
	A		(5.6)			590	939	6					
	B		(5.5)			275	469	6					
	C		(4.2)			175	312	6					
6-4		Cho Ho - San Jeong	11.3	P.1	1,243	225	368	7	20.5	19	17	16	12
6-5		Chil Ryang - Gwan San	15.9	P.1	1,306				21.7	19	18	17	12
	A		(5.9)			170	288	6					
	B		(7.6)			65	123	6					
	C		(2.4)			95	169	6					
6-6		Deog Dong - Jang Hang	11.4	G.2	1,132	100	200	7	17.4	16	14	14	10
6-7		Go Heung - Pung Yang	9.2	G.2	993	70	132	7	15.1	13	12	11	9
6-8		Yong San - Seong Jae	9.7	P.1*	1,064	150	323	7	21.4	20	18	17	13
6-9		Weol Am - Ji San	8.3	P.1	1,024	180	339	7	27.4	26	23	22	18
6-10		Gwang Yang - Jug Rim	9.4	P.1*	1,078				18.4	17	15	14	11
	A		(5.5)			275	446	6					
	B		(3.9)			100	169	6					
		Subtotal	122.2		13,740								
7		Gyeongsang Bug Do											
7-1		Go Ryeong - Do Seong	16.4		1,778				39.0	36	33	32	25
	A		(1.5)	P.2*		205	406	8					
	B		(8.2)	P.1									
	C		(6.7)	P.2*		285	523	8					
7-2		Sin Dang - Mae Gog	7.7	P.1	793	100	195	6	22.2	21	19	18	13
7-3		Ha Bin - Sin Dong	7.7	G.2	518	130	216	6	23.3	21	20	18	14
7-4		Byeong Jin - Seon Nam	15.2		1,086				39.2	36	33	32	35
	A		(4.2)	G.2		130	252	6					
	B		(5.9)	P.1		160	350	8					
	C		(5.1)	P.1		160	326	6					
7-6		Gim Cheon - Gu Mi	16.7	P.3*	2,130	370	681	8	31.2	28	27	25	19
7-7		Hyo Ryeong - Chang Pyeong	10.8	P.1	801	190	362	7	35.7	32	30	29	22
7-8		Il Jig - Jo Tab	3.0	P.1	282	150	302	5	40.5	36	34	32	24
7-9		Mag Gog - Jeo Jeon	9.9	P.1	848	120	232	7	26.0	24	22	20	16
7-10		Geum Jang - An Gang	8.3		1,193				30.3	27	26	25	18
	1		(1.5)	P.2*		500	853	7					
	2		(6.8)	G.2		160	320	7					
7-12		Gyeong San - An Sim	3.1	P.3*	355	610	1,001	9	35.9	32	31	29	22
7-13		Jan In - Jin Ryang	7.5	P.3*	878				45.5	43	39	37	30
	A		(5.2)			305	567	9					
	B		(2.3)			2,095	3,659	9					
7-14		Dan Chon - Song Nae	9.4	P.1	895	180	315	5	31.9	29	27	25	19
7-15		Nam Jeog - Bong Jung	16.6	P.2*	3,522				34.8	33	30	28	22
	1		(10.1)			255	463	5					
	2		(6.6)			245	474	6					
7-16		Mag Gog - Bu Gog	8.0	G.2	412	145	268	5	45.8	41	39	37	27
7-17		Mi Ho - Ye Cheon-Jug Rim	13.8	P.1*	1,672				23.4	22	19	18	14
	1		(7.6)			270	414	5					
	2		(6.2)			230	389	5					
7-19		Sang Un - Bong Seong	10.1	G.2	705	100	194	5	34.4	32	29	27	21
7-20		Yeong Su - Sun Heung	12.1	P.1	1,106	195	339	6	32.5	28	27	26	19
7-21		Yeong Su - Seog Pyeong	15.7		1,707				45.2	40	38	36	27
	A		(7.4)	P.1*		240	467	5					
	B		(6.5)	P.1*		125	256	5					
	C		(1.8)	P.3*		430	734	8					
		Subtotal	192.0		20.681								

Section No.	Sub-sec.	From - to	Length (km)	Standard /a	Construction costs (W mln at April 1982 prices)	Traffic (AADT) 1981 Actual	Traffic (AADT) 1985 forecast	Traffic (AADT) Growth rate (%)	Internal rate of return With time/b	Internal rate of return Without time/c	Sensitivity 1/d	Sensitivity 2/e	Sensitivity 3/f
8		Gyeongsang Nam Do											
8-1		Mu Rim-Pyeong Sa-Sang Ga	14.3		1,486				39.6	37	34	32	25
	1-A		(7.5)	P.2*		160	294	7					
	1-B		(4.1)	P.2*		300	609	7					
	2		(2.7)	P.1*		250	421	7					
8-2		Bang Ji - Jug Cheon	2.9	P.1	206	200	301	5	21.4	19	18	17	12
8-3		Seon Jin - Sin Bog	2.6	P.1	187	200	308	5	26.5	24	22	21	15
8-4		Gil Pyeong - Su Seog	2.2	P.3*	346	770	1,284	9	34.0	33	29	28	23
8-5		Geo Je - Sa Gog	4.1	P.3*	414	285	539	8	43.6	40	37	36	27
8-6		Myeong Dong - Jin Yeong	14.3	P.2*	2,109								
	A		(7.0)			380	613	6	29.4	27	25	24	18
	B		(7.3)			220	446	6					
8-7		Seom Am-Weon Ji-Gae Mog	17.0	P.2*	2,332				34.8	33	30	28	23
	1		(5.8)			225	413	8					
	2		(11.2)			350	645	8					
8-9		Mun San - Cho Jeon	8.9		931				28.0	26	24	22	17
	A		(5.4)	P.1		180	295	6					
	B		(3.5)	P.2		330	542	6					
8-10		Un Cheon - Jeong Geum	3.1	P.3	272	235	392	7	24.3	21	21	19	14
8-11		Mi Jeon-Dong Mae-Pyeong Sa	10.7	P.1	1,190				21.7	20	18	17	12
	1		(7.3)			200	316	5					
	2		(3.4)			150	280	5					
8-12		San Cheong - Si Cheon	12.5	P.1	1,112				28.5	26	24	23	17
	1		(4.9)			200	321	6					
	2		(7.6)			200	382	6					
8-14		San In - Dae San	11.1		1,120				24.6	23	21	19	15
	A		(0.3)	P.3*		200	327	6					
	B		(8.1)	P.1									
	C		(2.7)	P.2*		240	409	8					
8-15		Mu An - Nae Jin	8.0		651	250	438	7	40.9	37	35	33	25
	A		(0.8)	P.2									
	B		(7.2)	P.1*									
8-16		Weol Nae - Sin Am	6.0	P.3*	698	400	746	8	42.4	37	36	34	26
8-17		Weol Nae - Jang An Sa	8.1		836				29.3	28	25	24	19
	A		(4.1)	P.2*		300	525	8					
	B		(4.0)	P.1*		120	205	6					
8-18		Jwa Cheon - Weol Pyeong	12.1	P.3*	1,066	350	583	7	35.9	33	31	29	23
8-19		Hab Cheon - Dae Byeong	21.0	P.1*	1,756	250	424	7	34.5	32	29	28	22
8-20		Ga Jo - U Hye - Ji San	15.9	P.1	1,668				21.6	19	18	17	12
	1-A		(3.5)			210	328	7					
	1-B		(3.2)			120	217	6					
	2-A		(2.7)			330	508	7					
	2-B		(6.5)			150	248	5					
		Subtotal	174.8		18,380								
9		Jeju Do											
9-1		Sa Gye - Seo Gwang	5.9	P.1*	542	115	236	6	37.4	34	32	30	23
		Subtotal	5.9		542								
		Total	1,006.5		110,266								

/a Asterisk (*) indicates AC surface; the remainder DBST surface.
/b Basic savings, basic investment cost.
/c Basic savings minus time savings, and basic investment cost.
/d Basic savings, and investment cost increased by 25%.
/e Savings decreased by 25%, and basic investment cost.
/f A combination of all preceding tests: basic savings minus time savings, decreased by 25% and investment cost increased by 25%.

Source: First Gun Road Development Project - Final Report, Vol. 1, September 1982, BCEOM, Korea.

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

County (Gun) Road Improvement Program
(Unit: km)

Summary

Provinces (Do)	P.1 AC	P.1 DBST	P.1 Sub-total	P.2 AC	P.2 DBST	P.2 Sub-total	P.3 AC	P.3 DBST	P.3 Sub-total	Total AC	Total DBST	Total Total	Gravel G.2	Grand total
Gyeonggi Do	4.2	20.3	24.5	54.3	-	54.3	26.0	-	26.0	84.5	20.3	104.8	15.4	120.2
Gangweon Do	28.9	9.9	38.8	36.5	-	36.5	-	-	-	65.4	9.9	75.3	11.4	86.7
Chungcheong Bug Do	-	32.6	32.6	-	-	-	-	-	-	-	32.6	32.6	35.5	68.1
Chungcheong Nam Do	45.5	12.5	58.0	49.3	-	49.3	16.9	-	16.9	111.7	12.5	124.2	38.7	162.9
Jeonra Bug Do	7.5	-	7.5	30.3	14.0	44.3	-	-	-	37.8	14.0	51.8	21.9	73.7
Jeonra Nam Do	29.2	35.5	64.7	19.7	-	19.7	17.2	-	17.2	66.1	35.5	101.6	20.6	122.2
Gyeongsang Bug Do	27.7	72.1	99.8	26.3	-	26.3	29.1	-	29.1	83.1	72.1	155.2	36.8	192.0
Gyeongsang Nam Do	34.9	58.1	93.0	49.7	4.3	54.0	24.7	3.1	27.8	109.3	65.5	174.8	-	174.8
Jeju Do	5.9	-	5.9	-	-	-	-	-	-	5.9	-	5.9	-	5.9
Total	183.8	241.0	424.8	266.1	18.3	284.4	113.9	3.1	117.0	563.8	262.4	826.2	180.3	1,006.5

Note: P.1 = 5.0 m-wide pavement and 6.5 m-wide roadway.
P.2 = 6.0 m-wide pavement and 7.5 m-wide roadway.
P.3 = 6.2 m-wide pavement and 7.7 m-wide roadway.
G.2 = Gravel road with a 6.5 m-wide roadway.
AC = 5 cm-thick asphalt concrete.
DBST = Double bituminous surface treatment.

Source: First Gun Road Development Project - Final Report, Vol. I, September 1982, BCEOM, Korea, p. 41, A12-23.

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

County (Gun) Road Design Standards

Road type	G1		G2		P1		P2		P3	
Terrain type	F/H	M	F/H	M	F/H	M	F/H	M	F/H	M
Width (m)										
Roadway	5.0	5.0	6.5	6.5	6.5	6.0-6.5	7.5	7.0-7.5	7.7	7.0-7.5
Pavement	-	-	-	-	5.0	5.0	6.0	6.0	6.2	6.0
Shoulder	-	-	-	-	0.75	0.5-0.75	0.75	0.5-0.75	0.75	0.5-0.75
Right of way	>10.0	>10.0	>15.0	>15.0	15.0	>15.0	20.0	>20.0	25.0	>25.0
Design Speed (km/h)	40	30	40	30	40	30	50	30	60	30
Horizontal Alignment										
Normal crossfall	4	4	4	4	2.5	2.5	2.5	2.5	2.5	2.5
Maximum superelevation	8	8	8	8	7	7	7	7	7	7
Curve Radius										
Absolute minimum	50	25	50	25	50	25	80	25	125	25
Normal minimum	60	30	60	30	60	30	100	30	140	30
At minimum superelevation	200	120	200	150	200	150	300	150	350	150
Without superelevation	350	200	400	250	400	250	500	250	600	250
Vertical Alignment										
Maximum Gradient (%)										
Normal	-	10/a	-	8	-	8	-	7	-	7
Absolute	-	12/a	-	10/a	-	10	-	9	-	9
Curve Radius (m)										
Crest	700	300	700	500	700	500	1,000	700	1,500	900
Sag	500	250	500	300	500	300	800	300	1,000	500

/a Paving will be considered for slopes above 8%.

September 1982

Table 3.2

Table 3.3

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Comprehensive Maintenance Program - Physical Output (1983-87)

Maintenance works	1981	1982	1983	1984	1985	1986	1987
Provincial Roads							
Paved Roads							
Length (km)	759	1,460	1,700	1,940	2,180	2,432	2,670
Periodic (CT)							
Resurfacing (km)			170	215	270	340	380
% of total length			10	11	12	14	14
Routine (FA)							
Patching (sq m/km)			45	40	35	30	30
% of total area			0.75	0.65	0.58	0.50	0.50
Shoulder regraveling (km)			85	135	195	290	320
% of total length			5	7	9	12	12
Unpaved Roads							
Length (km)	8,932	9,158	8,918	8,678	8,438	8,186	7,948
Periodic (CT, FA)							
Regraveling (km)			415	520	750	740	840
% of total length			4.6	6.0	8.9	9.0	10.5
Routine (FA)							
Grading (no. of passes)			6	6	6	6	6
County Roads							
Paved Roads							
Length (km)	546	770	950	1,130	1,310	1,491	1,670
Periodic (CT)							
Resurfacing (km)			60	94	131	215	240
% of total length			6.5	8.5	10	14	14
Routine (FA)							
Patching (sq m/km)			36	36	36	36	36
Shoulder regraveling (km)			50	80	120	180	200
% of total length			5	7	9	12	12
Unpaved Roads							
Length (km)	10,933	11,730	11,580	11,400	11,287	11,106	10,927
Periodic (CT, FA)							
Regraveling (km)			300	400	675	775	875
% of total length			2.5	3.5	6	7	8
Routine (FA)							
Grading (no. of passes)			1	2	4	6	6

Notes: (1) CT = Contract.
(2) FA = Force account.
(3) Road lengths in Table reflect both new construction and reclassification of road categories.

Source: Consultants' study.

September 1982

Table 3.4

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Schedule of Maintenance Expenditures - All Provinces (1983-87)
(Billion won at December 1982 prices)

	1983	1984	1985	1986	1987	Total
Maintenance and Rehabilitation						
Provincial Roads						
Paved	4.8	6.1	7.0	8.4	9.3	35.6
Unpaved	4.3	5.5	8.3	13.1	14.3	45.5
Subtotal	9.1	11.6	15.3	21.5	23.6	81.1
County Roads						
Paved	2.0	2.8	3.7	5.1	5.8	19.4
Unpaved	2.0	3.6	8.0	14.9	15.0	43.5
Subtotal	4.0	6.4	11.7	20.0	20.8	62.9
Rehabilitation works	2.9	5.9	5.9	3.3	2.9	20.9
Total	16.0	23.9	32.9	44.8	47.3	164.9
Officials	2.4	2.8	2.9	3.1	3.1	14.3
GRAND TOTAL	18.4	36.7	35.8	47.9	50.4	179.2

Source: Consultants' study.

September 1982

Table 3.5

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Maintenance Program Physical Output for Pilot Provinces (1983-87)

	Gangweon					Jeonnam					Gyeongbug				
	1983	1984	1985	1986	1987	1983	1984	1985	1986	1987	1983	1984	1985	1986	1987
Provincial Roads															
Paved Roads															
Length (km)	82	102	123	145	169	139	166	194	225	258	103	135	169	205	262
Rehabilitation															
km	3	6	6	3	3	5	10	10	6	5	4	7	7	4	4
%	3.5	7.0	7.0	4.0	3.5	3.5	7.0	7.0	4.0	3.5	3.5	7.0	7.0	4.0	3.5
Resurfacing															
km	8	11	14	20	24	14	18	23	31	36	10	15	20	28	36
%	10	11	12	14	14	10	11	12	14	14	10	11	12	14	14
Patching															
sq m/km	45	40	35	30	30	45	40	35	30	30	45	40	35	30	30
%	0.75	0.65	0.58	0.50	0.50	0.75	0.65	0.58	0.50	0.50	0.75	0.65	0.58	0.50	0.50
Shoulders															
km	4	7	11	17	20	7	11	17	27	31	5	9	15	25	31
%	5	7	9	12	12	5	7	9	12	12	5	7	9	12	
Unpaved Roads															
Length (km)	785	765	744	722	698	1,258	1,231	1,203	1,172	1,139	1,733	1,701	1,667	1,631	1,574
Regraveling															
km	35	46	56	65	73	57	74	90	105	120	78	102	125	147	165
%	4.5	6.0	7.5	9.0	10.5	4.5	6.0	7.5	9.0	10.5	4.5	6.0	7.5	9.0	10.5
Grading (passes)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
County Roads															
Paved Roads															
Length (km)	32	72	113	154	195	52	97	142	187	232	25	105	185	265	325
Rehabilitation															
km	1	2	2	1	1	2	4	4	2	2	1	2	2	1	1
%	3.5	7.0	7.0	4.0	3.5	3.5	7.0	7.0	4.0	3.5	3.5	7.0	7.0	4.0	3.5
Resurfacing															
km	3	7	11	12	10	5	11	14	15	12	3	10	7	7	10
%	10	10	10	8	5	10	11	10	8	5	10	10	4	3	3
Patching															
sq m/km	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
%	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Shoulders															
km	2	5	10	18	23	3	7	13	22	28	1	7	16	32	39
%	5	7	9	12	12	5	7	9	12	12	5	7	9	12	12
Unpaved Roads															
Length (km)	1,139	1,099	1,058	1,017	976	1,839	1,794	1,749	1,704	1,659	1,878	1,798	1,718	1,638	1,578
Regraveling															
km	45	55	63	71	79	74	90	105	120	133	75	90	103	115	126
%	4	5	6	7	8	4	5	6	7	8	4	5	6	7	8
Grading (passes)	2	3	4	6	6	2	3	4	6	6	2	3	4	6	6

Source: Consultants' Study

October 1982

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Maintenance Program: Expenditures for Pilot Provinces (1983-87)
(Million won at December 1982 prices)

		Unit cost	1983	1984	1985	1986	1987
Gangweon Pilot Province							
Provincial							
Paved Roads (km)			(82)	(102)	(123)	(145)	(169)
Resurfacing	CT	15.3 MW/km	122	168	214	306	367
Patching	FA	10,500 W/sq m	39	43	45	46	53
Shoulders	FA	0.7 MW/km	3	5	8	12	14
Patrolmen	FA	0.46 MW/km	38	47	57	67	78
Others	FA	0.09→0.15 MW/km	7	10	13	18	25
Emergency	FA	0.28 MW/km	23	28	34	41	47
Bridges	CT	0.28 MW/km					
Total Paved			232	301	371	490	584
Unpaved Roads (km)			(785)	(765)	(744)	(722)	(698)
Regraveling	CT,FA	7.3→16.5 MW/km	255	375	554	817	1,204
Grading	FA	0.02 MW/km	94	92	89	86	83
Patrolmen	FA	0.15 MW/km	118	115	112	108	105
Others	FA	0.04→0.09 MW/km	31	37	44	53	63
Emergency	FA	0.09→0.19 MW/km	70	82	96	113	132
Bridges	CT	0.09→0.19 MW/km					
Total Unpaved			568	701	895	1,177	1,587
Total Maintenance			800	1,002	1,266	1,667	2,171
Gun							
Paved Roads (km)			(32)	(72)	(113)	(154)	(195)
Resurfacing	CT	14.5 MW/km	43	101	159	174	145
Patching	FA	10,500 W/sq m	12	27	43	58	74
Shoulders	FA	0.7 MW/km	1	3	7	13	16
Patrolmen	FA	0.46 MW/km	15	33	52	71	90
Others	FA	0.07→0.13 MW/km	2	4	7	13	25
Emergency	FA	0.27 MW/km	9	19	31	42	53
Bridges	CT	0.27 MW/km					
Total Paved			82	187	299	371	403
Unpaved Roads (km)			(1,139)	(1,099)	(1,058)	(1,017)	(976)
Regraveling	CT,FA	6→12.5 MW/km	270	373	516	714	988
Grading	FA	0.015 MW/km	34	49	63	92	88
Patrolmen	FA	0.05→0.15 MW/km	57	72	91	116	146
Others	FA	0.02→0.05 MW/km	23	28	34	41	49
Emergency	FA	0.04→0.16 MW/km	46	62	85	115	156
Bridges	CT	0.04→0.16 MW/km					
Total Unpaved			430	584	789	1,078	1,427
Total Maintenance			512	771	1,088	1,449	1,830
Total Maintenance - Provincial and Gun			1,312	1,733	2,354	3,116	4,001
Rehabilitation							
Provincial		33 MW/km	99	198	198	99	99
Gun		31 MW/km	31	62	62	31	31
Total Rehabilitation			130	260	260	130	130
Total Maintenance and Rehabilitation			1,442	2,033	2,614	3,216	4,131

		Unit cost	1983	1984	1985	1986	1987
Jeonnam Pilot Province							
Provincial							
Paved Roads (km)			(139)	(166)	(194)	(225)	(258)
Resurfacing	CT	15.3 MW/km	214	275	352	474	551
Patching	FA	10,500 W/sq m	66	70	71	71	81
Shoulders	FA	0.7 MW/km	5	8	12	19	22
Patrolmen	FA	0.46 MW/km	64	76	89	113	119
Others	FA	0.09→0.15 MW/km	12	16	21	28	38
Emergency	FA	0.28 MW/km	39	46	54	63	72
Bridges	CT	0.28 MW/km					
Total Paved			400	491	599	768	883
Unpaved Roads (km)			(1,258)	(1,231)	(1,203)	(1,172)	(1,139)
Regraveling	CT,FA	7.3→16.5 MW/km	416	614	907	1,340	1,980
Grading	FA	0.02 MW/km	151	148	144	141	137
Patrolmen	FA	0.15 MW/km	189	185	180	176	171
Others	FA	0.04→0.09 MW/km	50	60	72	86	102
Emergency	FA	0.09→0.19 MW/km	113	133	156	184	216
Bridges	CT	0.09→0.19 MW/km					
Total Unpaved			919	1,140	1,459	1,927	2,606
Total Maintenance			1,319	1,631	2,058	2,695	3,489
Gun							
Paved Roads (km)			(52)	(97)	(142)	(187)	(232)
Resurfacing	CT	14.5 MW/km	72	159	203	217	174
Patching	FA	10,500 W/sq m	20	36	54	71	87
Shoulders	FA	0.7 MW/km	2	5	9	15	20
Patrolmen	FA	0.46 MW/km	24	44	65	86	107
Others	FA	0.07→0.13 MW/km	3	6	10	17	30
Emergency	FA	0.27 MW/km	14	26	38	50	63
Bridges	CT	0.27 MW/km					
Total Paved			135	276	379	456	481
Unpaved Roads (km)			(1,839)	(1,794)	(1,749)	(1,704)	(1,659)
Regraveling	CT,FA	6→12.5 MW/km	444	617	859	1,195	1,162
Grading	FA	0.015 MW/km	55	80	105	153	149
Patrolmen	FA	0.05→0.15 MW/km	92	118	151	194	249
Others	FA	0.02→0.05 MW/km	36	44	54	67	83
Emergency	FA	0.04→0.16 MW/km	73	100	139	192	265
Bridges	CT	0.04→0.16 MW/km					
Total Unpaved			700	959	1,308	1,801	2,408
Total Maintenance			835	1,235	1,687	2,257	2,889
Total Maintenance - Provincial and Gun			2,154	2,866	3,745	4,952	6,378
Rehabilitation							
Provincial		33 MW/km	165	330	330	198	165
Gun		31 MW/km	62	124	124	62	62
Total Rehabilitation			227	454	454	260	227
Total Maintenance and Rehabilitation			2,381	3,320	4,199	5,212	6,605

		Unit cost	1983	1984	1985	1986	1987
Gyeongbug Pilot Province							
Provincial							
Paved Roads (km)			(103)	(135)	(169)	(205)	(262)
Resurfacing	CT	15.3 MW/km	153	230	306	428	550
Patching	FA	10,500 W/sq m	49	57	62	65	82
Shoulders	FA	0.7 MW/km	4	6	10	17	22
Patrolmen	FA	0.46 MW/km	47	62	78	94	120
Others	FA	0.09→0.15 MW/km	9	13	19	27	39
Emergency	FA	0.28 MW/km	29	38	47	57	73
Bridges	CT	0.28 MW/km					
Total Paved			291	406	522	688	886
Unpaved Roads (km)			(1,733)	(1,701)	(1,667)	(1,631)	(1,574)
Regraveling	CT,FA	7.3→16.5 MW/km	570	842	1,245	1,842	2,722
Grading	FA	0.02 MW/km	208	204	200	196	189
Patrolmen	FA	0.15 MW/km	260	255	250	245	236
Others	FA	0.04→0.09 MW/km	69	82	99	118	142
Emergency	FA	0.09→0.19 MW/km	156	183	216	254	299
Bridges	CT	0.09→0.19 MW/km					
Total Unpaved			1,263	1,566	2,010	2,655	3,588
Total Maintenance			1,554	1,972	2,532	3,343	4,474
Gun							
Paved Roads (km)			(25)	(105)	(185)	(265)	(325)
Resurfacing	CT	14.5 MW/km	43	145	101	101	145
Patching	FA	10,500 W/sq m	9	39	70	100	123
Shoulders	FA	0.7 MW/km	1	5	11	22	27
Patrolmen	FA	0.46 MW/km	11	48	85	122	150
Others	FA	0.07→0.13 MW/km	2	5	9	20	42
Emergency	FA	0.27 MW/km	7	28	50	72	88
Bridges	CT	0.27 MW/km					
Total Paved			73	270	326	437	575
Unpaved Roads (km)			(1,878)	(1,798)	(1,718)	(1,638)	(1,578)
Regraveling	CT,FA	6→12.5 MW/km	450	615	842	1,151	1,575
Grading	FA	0.015 MW/km	56	81	103	147	142
Patrolmen	FA	0.05→0.15 MW/km	94	118	149	188	236
Others	FA	0.02→0.05 MW/km	38	46	55	66	78
Emergency	FA	0.04→0.16 MW/km	76	102	138	187	252
Bridges	CT	0.04→0.16 MW/km					
Total Unpaved			714	962	1,287	1,739	2,283
Total Maintenance			787	1,232	1,613	2,176	2,858
Total Maintenance - Provincial and Gun			2,341	3,204	4,145	5,519	6,332
Rehabilitation							
Provincial		33 MW/km	132	231	231	132	132
Gun		31 MW/km	31	62	62	31	31
Total Rehabilitation			163	293	293	163	163
Total Maintenance and Rehabilitation			2,504	3,497	4,438	5,682	6,495

Source: Consultants' study.

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KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Equipment for Maintenance Program and Costs
(Won million)

Type of equipment	Characteristics: Power (hp)	Characteristics: Capacity	Unit cost	Total: No.	Total: Cost	1983: No.	1983: Cost	1984: No.	1984: Cost
Air compressor	76	250 CFm	11.20	17	190.40	17	190.40	-	-
Hand sprayer	3.5	200 l	3.00	17	51.00	17	51.00	-	-
Vibrating roller	26	0.9 T	8.70	15	130.50	15	130.50	-	-
Tire roller	38	10 T	50.60	36	1,821.60	15	759.00	21	1,062.60
Dumper	60	1.3 cu m	20.55	16	328.80	16	328.80	-	-
Bulldozer	195	21 T	178.20	2	356.40	-	-	2	356.40
Wheel loader	102	1.5 cu m	65.50	7	458.50	6	393.00	1	65.50
Motorgrader	145	3.7 m	110.70	67	7,416.90	30	3,321.00	37	4,095.90
Water tank truck		5,500 l	12.70	36	457.20	14	177.80	22	279.40
Dump truck	185	8 T	26.85	146	3,920.10	90	2,416.50	56	1,503.60
Small truck		2.5 T	8.52	38	323.76	23	195.96	15	127.80
Crusher/screening plant	120	25 T	142.00	8	1,136.00	8	1,136.00	-	-
Management vehicles			5.00	38	190.00	38	190.00	-	-
Subtotal					16,781.16		9,289.96		7,491.20
Spare parts about 20%					3,329.84		1,843.38		1,486.46
Total				443	20,111.00	289	11,133.34	154	8,977.66

Sources: Consultants' study, MOHA and mission.

October 1982

Table 3.8

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Cumulative Disbursement Schedule

IBRD fiscal year and quarter	Estimated cumulative disbursement		Cumulative disbursement country profile (%)
	US$ million	%	
1982/83			
March 31, 1983	-	-	-
June 30, 1983	3.00	2.0	0.8
1983/84			
September 30, 1983	-	-	-
December 31, 1983	15.00	12.0	5.5
March 31, 1984	-	-	-
June 30, 1984	25.00	20.0	14.0
1984/85			
September 30, 1984	-	-	-
December 31, 1984	35.00	28.0	26.1
March 31, 1985	-	-	-
June 30, 1985	50.00	40.0	40.4
1985/86			
September 30, 1985	-	-	-
December 31, 1985	70.00	56.0	55.1
March 31, 1986	-	-	-
June 30, 1986	90.00	72.0	68.2
1986/87			
September 30, 1986	-	-	-
December 31, 1986	100.0	80.0	78.9
March 31, 1987	-	-	-
June 30, 1987	115.00	92.0	87.0
1987/88			
September 30, 1987	-	-	-
December 31, 1987	125.00	100.0	93.0
March 31, 1988			-
June 30, 1988			97.1
1988/89			
September 30, 1988			100.0
December 31, 1988			
March 31, 1989			
June 30, 1989			

Source: Bank Staff.

November 1982

Table 4.1

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Distribution of County Road Improvement Works by Traffic Range and by Province (1981 and 1985)
(Total road lengths in km and number of sections)

Provinces	Traffic range /a 50-199 1981	50-199 1985	200-399 1981	200-399 1985	400-699 1981	400-699 1985	700-999 1981	700-999 1985	1,000-1,400 1981	1,000-1,400 1985	Total Length	Total Section	Counties served
Gyeonggi													
Lengths	58.35	26.02	29.26	26.01	36.11	25.52	8.90	34.64	-	20.43	132.62	-	13
Sections	(10)	(4)	(5)	(5)	(8)	(5)	(1)	(7)	-	(3)	-	(24)	-
Gangweon													
Lengths	39.46	5.04	43.44	27.19	3.48	54.15	-	-	-	-	86.38	-	6
Sections	(6)	(1)	(9)	(5)	(1)	(10)	-	-	-	-	-	(16)	-
Chung Bug													
Lengths	68.43	27.26	-	41.17	-	-	-	-	-	-	68.43	-	5
Sections	(7)	(2)	-	(5)	-	-	-	-	-	-	-	(7)	-
Chung Nam													
Lengths	68.27	6.55	88.66	73.46	6.67	70.89	-	12.70	1.06	1.06	164.66	-	12
Sections	(8)	(1)	(11)	(9)	(2)	(9)	-	(2)	(1)	(1)	-	(22)	-
Jeon Bug													
Lengths	29.42	5.75	29.96	35.61	14.87	18.02	-	14.87	-	-	74.25	-	16
Sections	(5)	(2)	(3)	(4)	(2)	(2)	-	(2)	-	-	-	(10)	-
Jeon Nam													
Lengths	64.01	35.80	51.60	39.21	8.00	40.60	-	8.00	-	-	123.61	-	11
Sections	(9)	(5)	(5)	(5)	(2)	(4)	-	(2)	-	-	-	(16)	-
Gyeong Bug													
Lengths	108.16	35.69	75.77	82.17	6.51	66.07	-	6.51	2.22	2.22	192.66	-	15
Sections	(15)	(4)	(9)	(12)	(3)	(8)	-	(3)	(1)	(1)	-	(28)	-
Gyeong Nam													
Lengths	30.54	-	136.70	63.58	6.00	103.66	2.24	6.00	-	2.24	175.48	-	11
Sections	(6)	-	(22)	(13)	(1)	(15)	(1)	(1)	-	(1)	-	(30)	-
Jeju													
Lengths	6.00	-	-	6.00	-	-	-	-	-	-	6.0	-	1
Sections	(1)	-	-	(1)	-	-	-	-	-	-	-	(1)	-
Total													
Lengths	472.64	142.11	455.39	394.4	81.63	378.51	11.14	82.72	3.26	25.55	1,024.09/c	-	80
Sections /b	(67)	(19)	(64)	(59)	(19)	(53)	(2)	(17)	(2)	(6)	-	154	-

/a Traffic expressed in average annual daily traffic (AADT).

/b The number of homogenous traffic sections is greater than the number of roads (99 links) proposed for improvement.

/c Original unimproved length; improved length is 1,006 km.

Sources: Consultants' and mission's estimates.

September 1982

Table 4.2

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

County Road Improvement Works - Traffic Composition and Growth Rates (1985-2005)

A. Typical Traffic Composition in 1980 (%)

Province	Cars	Taxis	Buses	Light trucks	Heavy trucks	Total
Gyeonggi	22	14	17	35	12	100
Gangweon	20	18	07	32	23	100
Chung Bug	11	21	18	38	12	100
Chung Nam	12	21	13	30	24	100
Jeon Bug	18	24	12	28	18	100
Jeon Nam	12	29	09	35	14	100
Gyeong Bug	11	17	15	41	16	100
Gyeong Nam	18	21	13	39	09	100
Jeju	38	16	19	17	19	100
Average	18	18	14	35	15	100
Standard composition	20	20	10	35	15	100

B. Traffic Growth Rates (1985-2005) (%)

	Basic rate	Cars	Taxis	Buses	Light trucks	Heavy trucks
Normal Traffic Growth Rates						
Local /a	5	7	4	5	4	6
Through traffic /b	8	10	7	8	7	9
Close to cities	9	11	8	9	8	10
Elasticity factor for generated traffic /c	-	1.00	0.50	0.50	0.50	0.25

/a Road function is purely serving local area without through traffic.
/b Road in rural area but bears substantial through traffic.
/c Factors are applied to the VOCs' savings that occur with road improvements.

Sources: MOHA counts (September 1980) and consultants' estimates.

September 1982

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Estimated Vehicle Operating Costs and Savings for Typical Terrains and Improvement Standards
(Won per km, excluding tax and passenger time)

	Cars		Taxis		Buses		Light trucks		Heavy trucks	
Existing roads	Track (T)	Gravel (G1)	Track (T)	Gravel (G1)	Track (T)	Gravel (G1)	Track (T)	Gravel (G1)	Track (T)	Gravel (G1)
Flat	181	144	376	271	583	437	437	330	748	552
Rolling	194	153	425	303	648	480	495	375	848	620
Hilly	222	174	534	379	794	579	640	463	1,094	778
Mountainous	285	218	825	579	1,170	841	1,045	785	1,755	1,305
Improved roads	Gravel (G2)	Paved (P2)	Gravel (G2)	Paved (P2)	Gravel (G2)	Paved (P2)	Gravel (G2)	Paved (P2)	Gravel (G2)	Paved (P2)
Flat	134	109	227	195	374	308	267	212	442	345
Rolling	138	112	250	213	405	332	297	236	491	382
Hilly	153	121	306	257	479	391	366	290	606	469
Mountainous	189	147	459	386	676	551	588	470	975	764

Savings from improvements	T to G2		G1 to P2		T to G2		G1 to P2		T to G2		G1 to P2		T to G2		G1 to P2		T to G2		G1 to P2	
	Won	%	Won	%	Won	%	Won	%	Won	%	Won	%	Won	%	Won	%	Won	%	Won	%
Flat	47	26	35	24	110	29	76	28	209	36	129	30	170	39	118	36	306	41	207	38
Rolling	56	29	41	27	175	41	90	30	243	38	148	31	198	40	139	37	357	42	238	38
Hilly	69	31	53	30	228	43	122	32	315	40	188	32	274	43	173	37	488	45	309	40
Mountainous	96	34	71	33	366	44	193	33	494	42	290	34	457	44	315	40	780	44	541	41

All VOCs are expressed in April 1982 prices.

Sources: Consultants and mission estimates.

October, 1982

Table 4.3

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

County Roads Improvement Program: Economic Evaluation

A. Internal Rates of Return

No.	Province	Project length (km)	Internal Rate of Return				
			With time	With-out time	Sensitivity 1 /a	2 /b	3 /c
1.	Gyeonggi	120.147	33.2	31	28	27	21
2.	Gangweon	86.718	27.6	25	23	22	17
3.	Chungcheong Bug	68.064	22.6	20	19	18	13
4.	Chungcheong Nam	162.858	31.4	29	27	25	20
5.	Jeonra Bug	73.677	27.7	25	23	22	17
6.	Jeonra Nam	122.239	24.9	23	21	20	15
7.	Gyeongsang Bug	192.041	34.5	31	29	28	21
8.	Gyeongsang Nam	174.831	31.7	29	27	26	20
9.	Jeju	5.917	37.4	34	32	30	23
	Total	1,006.492	30.5	28	26	25	19

B. Economic Flows for all County Roads Improvements

(W million)

Year	Invest-ment (1)	Total savings (2)	Maintenance Costs: Existing road (3)	Maintenance Costs: Project Road Routine (4)	Maintenance Costs: Project Road Periodic (5)	Total -1+2+3-4-5
1983	34,430	-	-	-	-	-34,430
1984	45,907	-	-	-	-	-45,907
1985	34,430	15,723	195	485	-	-18,997
1986	-	33,600	391	969	-	33,022
1987	-	35,902	"	"	-	35,324
1988	-	38,362	"	"	-	37,783
1989	-	40,990	"	"	-	40,411
1993	-	53,430	"	"	2,574	50,277
1996	-	65,180	"	"	11,400	53,202
2000	-	84,962	"	"	10,536	73,847
2005	-	118,334	"	"	-	117,756
2006	-57,384	-	-	-	-	57,384

/a Basic savings and investment costs increased by 25%.
/b Savings decreased by 25%, and basic investment cost.
/c A combination of all preceding tests: basic savings without time, savings decreased by 25% and investment costs increased by 25%.

Source: First Gun Road Development Project - Final Report, Vol. 1, September 1982, BCEOM, Korea A61-62.

October 1982

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

County Roads Improvement Program: Economic Evaluation

GYEONGGI DO 1

ECONOMIC FLOWS (W million)

YEAR	INVEST-MENT	TOTAL SAVINGS	MAINTENANCE COSTS			TOTAL
			EXISTING ROAD	PROJECT ROAD		
				ROUTINE	PERIODIC	
	(1)	(2)	(3)	(4)	(5)	-1+2+3-4-5
1983	4,481	-	-	-	-	-4,481
1984	5,975	-	-	-	-	-5,975
1985	4,481	2,280	23	58	-	-2,237
1986	-	4,879	47	116	-	4,810
1987	-	5,222	"	"	-	5,152
1988	-	5,588	"	"	-	5,518
1989	-	5,981	"	"	-	5,911
1993	-	7,846	"	"	253	7,523
1996	-	9,617	"	"	1,730	7,817
2000	-	12,616	"	"	1,305	11,441
2005	-	17,712	"	"	-	17,642
2006	-7,469	-	-	-	-	7,469

GANGWEON DO 2

ECONOMIC FLOWS (W million)

YEAR	INVEST-MENT	TOTAL SAVINGS	MAINTENANCE COSTS			TOTAL
			EXISTING ROAD	PROJECT ROAD		
				ROUTINE	PERIODIC	
	(1)	(2)	(3)	(4)	(5)	-1+2+3-4-5
1983	3,154	-	-	-	-	-3,154
1984	4,205	-	-	-	-	-4,205
1985	3,154	1,259	17	42	-	-1,920
1986	-	2,680	34	86	-	2,640
1987	-	2,824	"	"	-	2,824
1988	-	3,071	"	"	-	3,021
1989	-	3,281	"	"	-	3,231
1993	-	4,275	"	"	154	4,071
1996	-	5,214	"	"	1,356	3,808
2000	-	6,794	"	"	613	6,131
2005	-	9,458	"	"	-	9,408
2006	-5,257	-	-	-	-	5,257

CHUNGCHEONG BUG DO 3

ECONOMIC FLOWS (W million)

YEAR	INVEST-MENT	TOTAL SAVINGS	MAINTENANCE COSTS			TOTAL
			EXISTING ROAD	PROJECT ROAD		
				ROUTINE	PERIODIC	
	(1)	(2)	(3)	(4)	(5)	-1+2+3-4-5
1983	2,113	-	-	-	-	-2,113
1984	2,818	-	-	-	-	-2,818
1985	2,113	686	13	32	-	-1,446
1986	-	1,455	26	64	-	1,417
1987	-	1,562	"	"	-	1,505
1988	-	1,635	"	"	-	1,598
1989	-	1,736	"	"	-	1,696
1993	-	2,191	"	"	323	1,831
1996	-	2,612	"	"	147	2,427
2000	-	3,391	"	"	850	2,634
2005	-	4,423	"	"	-	4,386
2006	-3,522	-	-	-	-	3,522

CHUNGCHEONG NAM DO 4

ECONOMIC FLOWS (W million)

YEAR	INVEST-MENT	TOTAL SAVINGS	MAINTENANCE COSTS			TOTAL
			EXISTING ROAD	PROJECT ROAD		
				ROUTINE	PERIODIC	
	(1)	(2)	(3)	(4)	(5)	-1+2+3-4-5
1983	5,840	-	-	-	-	-5,840
1984	7,786	-	-	-	-	-7,786
1985	5,840	2,699	32	78	-	-3,186
1986	-	5,802	63	156	-	5,709
1987	-	6,215	"	"	-	6,143
1988	-	6,701	"	"	-	6,608
1989	-	7,202	"	"	-	7,109
1993	-	8,606	"	"	449	9,065
1996	-	11,923	"	"	4,885	6,946
2000	-	15,904	"	"	1,522	14,289
2005	-	22,798	"	"	-	22,706
2006	-9,733	-	-	-	-	9,733

JEONRA BUG DO 5

ECONOMIC FLOWS (W million)

YEAR	INVEST-MENT	TOTAL SAVINGS	MAINTENANCE COSTS			TOTAL
			EXISTING ROAD	PROJECT ROAD		
				ROUTINE	PERIODIC	
	(1)	(2)	(3)	(4)	(5)	-1+2+3-4-5
1983	2,543	-	-	-	-	-2,543
1984	3,391	-	-	-	-	-3,391
1985	2,543	1,044	14	35	-	-1,520
1986	-	2,222	29	70	-	2,180
1987	-	2,364	"	"	-	2,322
1988	-	2,516	"	"	-	2,474
1989	-	2,677	"	"	-	2,635
1993	-	3,433	"	"	247	3,143
1996	-	4,136	"	"	583	3,511
2000	-	5,303	"	"	874	4,388
2005	-	7,235	"	"	-	7,194
2006	-4,239	-	-	-	-	4,239

JEONRA NAM DO 6

ECONOMIC FLOWS (W million)

YEAR	INVEST-MENT	TOTAL SAVINGS	MAINTENANCE COSTS			TOTAL
			EXISTING ROAD	PROJECT ROAD		
				ROUTINE	PERIODIC	
	(1)	(2)	(3)	(4)	(5)	-1+2+3-4-5
1983	4,255	-	-	-	-	-4,255
1984	5,674	-	-	-	-	-5,674
1985	4,255	1,504	24	59	-	-2,787
1986	-	3,206	47	118	-	3,138
1987	-	3,423	"	"	-	3,352
1988	-	3,651	"	"	-	3,581
1989	-	3,895	"	"	-	3,825
1993	-	5,045	"	"	319	4,656
1996	-	6,126	"	"	1,223	4,832
2000	-	7,936	"	"	1,420	6,444
2005	-	10,963	"	"	-	10,893
2006	-7,092	-	-	-	-	7,092

GYEONGSANG BUG DO 7

ECONOMIC FLOWS (W million)

YEAR	INVEST-MENT	TOTAL SAVINGS	MAINTENANCE COSTS			TOTAL
			EXISTING ROAD	PROJECT ROAD		
				ROUTINE	PERIODIC	
	(1)	(2)	(3)	(4)	(5)	-1+2+3-4-5
1983	6,401	-	-	-	-	-6,401
1984	8,534	-	-	-	-	-8,534
1985	6,401	3,496	37	92	-	-2,960
1986	-	7,451	75	185	-	7,341
1987	-	7,942	"	"	-	7,832
1988	-	8,465	"	"	-	8,354
1989	-	9,022	"	"	-	8,911
1993	-	11,642	"	"	560	10,971
1996	-	16,005	"	"	1,667	12,323
2000	-	18,189	"	"	2,433	15,646
2005	-	25,016	"	"	-	24,906
2006	-10,668	-	-	-	-	10,668

GYEONGSANG NAM DO 8

ECONOMIC FLOWS (W million)

YEAR	INVEST-MENT	TOTAL SAVINGS	MAINTENANCE COSTS			TOTAL
			EXISTING ROAD	PROJECT ROAD		
				ROUTINE	PERIODIC	
	(1)	(2)	(3)	(4)	(5)	-1+2+3-4-5
1983	5,447	-	-	-	-	-5,447
1984	7,263	-	-	-	-	-7,263
1985	5,447	2,635	34	85	-	-2,863
1986	-	5,633	68	170	-	5,530
1987	-	6,020	"	"	-	5,917
1988	-	6,433	"	"	-	6,331
1989	-	6,875	"	"	-	6,773
1993	-	8,969	"	"	342	8,524
1996	-	10,947	"	"	2,181	8,664
2000	-	14,281	"	"	7,214	11,964
2005	-	19,909	"	"	-	19,806
2006	-9,079	-	-	-	-	9,079

JEJU DO 9

ECONOMIC FLOWS (W million)

YEAR	INVEST-MENT	TOTAL SAVINGS	MAINTENANCE COSTS			TOTAL
			EXISTING ROAD	PROJECT ROAD		
				ROUTINE	PERIODIC	
	(1)	(2)	(3)	(4)	(5)	-1+2+3-4-5
1983	196	-	-	-	-	-196
1984	262	-	-	-	-	-262
1985	196	120	1	3	-	-78
1986	-	256	2	6	-	253
1987	-	272	"	"	-	269
1988	-	289	"	"	-	286
1989	-	308	"	"	-	304
1993	-	393	"	"	8	389
1996	-	472	"	"	139	330
2000	-	683	"	"	6	603
2005	-	819	"	"	-	816
2006	-327	-	-	-	-	327

Development Project-Final Report, Vol. 1, September 1982, KOEOM, Korea, A62-66.

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Provincial and County Roads Maintenance Program: Potential Savings in VOCs
(Without taxes, December 1982 prices)

Traffic range (AADT) /a		Graveled roads						Paved roads							
		50	100	200	400		Total	100	200	400	1000	1000	2000		Total
Road type	Unit	25 T	75 T/G1	150 G1/G2	300 G2	600 G3	or (average)	75 P1	150 P1	300 P1/P2	600 P2	900 P2	1000 P2	3000 P2	or (average)
(1) Basic VOC	w/km	591	523	416	376	355	(384)	317	317	296	275	275	275	275	(277)
Without Program															
(2) Speed reduction	%	-50	-45	-35	-30	-20	(-32)	-30	-20	-15	-10	-10	-10	-10	(-11)
(3) VOC increase	%	+78	+65	+45	+35	+21	(+39)	+35	+21	+15	+10	+10	+10	+10	(+11)
(4) Actual VOC	w/km	1,051	863	602	508	429	(536)	428	383	341	303	303	303	303	(306)
With Program															
(5) Speed reduction	%	-25	-22	-17	-15	-10	(-16)	0	0	0	0	0	0	0	(0)
(6) VOC increase	%	+28	+24	+18	+15	+10	(+16)	0	0	0	0	0	0	0	(0)
(7) Actual VOC	w/km	756	648	490	432	391	(445)	317	317	296	275	275	275	275	(277)
1986 Network Length															
(8) Provincial	km	900	1,450	2,647	2,261	928	8,186	119	195	404	910	341	463	-	2,432
(9) Gun	km	1,100	2,400	4,136	3,081	389	11,106	65	138	435	497	148	174	34	1,491
(10) Total	km	2,000	2,850	6,780	5,342	1,317	19,292	184	333	839	1,407	489	637	34	3,923
1992 Network Length															
(11) Provincial	km	675	820	1,729	2,361	1,914	7,499	31	139	349	536	1,449	372	343	3,119
(12) Gun	km	825	1,259	2,781	3,572	2,381	10,818	17	84	215	451	694	155	163	1,779
(13) Total	km	1,500	2,079	4,510	5,933	4,295	18,317	48	23	464	987	2,143	527	506	4,898
Annual Traffic x Length															
(14) In 1986	10^6 veh. km	18.3	105.4	371.4	584.9	288.4	1,376.6	5.0	18.0	91.9	308.1	160.6	348.8	37.2	969.8
(15) In 1992	10^6 veh. km	13.7	56.9	246.9	649.7	940.6	1,907.8	1.3	12.2	50.8	216.2	704.0	288.4	554.1	1,827.1
Transportation Costs															
In 1986:															
(16) Without program	10^9 w	19.1	90.9	223.6	297.3	123.7	754.7	2.1	7.0	31.3	93.3	48.7	105.6	11.3	299.3
(17) With program	10^9 w	13.9	68.3	182.0	252.9	112.9	630.0	1.6	5.7	27.1	84.7	$$.2	95.9	10.3	269.5
(18) = Savings	10^9 w	5.4	22.6	41.7	44.4	10.9	124.9	0.5	1.2	4.2	8.5	4.5	9.7	1.0	29.8
In 1992:															
(19) Without program	10^9 w	14.4	49.2	148.7	330.2	403.6	945.9	0.5	4.7	17.4	65.4	213.2	87.3	167.7	556.3
(20) With program	10^9 w	10.4	37.0	120.9	280.8	367.8	816.9	0.3	3.8	15.0	59.5	193.5	79.3	152.3	503.7
(21) = Savings	10^9 w	4.1	12.2	27.7	49.3	35.6	129.0	0.2	0.9	2.3	6.1	19.7	8.0	15.5	52.5

/a Annual average daily traffic.

Notes: (4) = (1) x [1+(3)]
(7) = (1) x [1+(6)]
(8) to (13) = present estimates
(14) = (10) x average AADT x 365
(15) = (13) x average AADT x 365
(16) = (4) x (14)
(17) = (7) x (14)
(18) = (16) - (17)
(19) = (4) x (15)
(20) = (7) x (15)
(21) = (19) - (20)

Source: Consultants' estimates

September 1982

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Provincial and County Roads Maintenance Program:
Economic Evaluation 1983-92
(Billion won without taxes, at December 1982 prices)

Years	Costs							Benefits							
								Paved roads			Graveled Roads				
	Equipment (1)	TAS & training (2)	Rehabilitation (3)	Recurrent costs (4)	Total costs (5)	Cost without program (6)	Program's increase in costs (7)=(5)-(6)	Potential savings (8)	Effic. coeff. (9)	Actual savings (10)=(8) x(9)	Potential savings (11)	Effic. coeff. (12)	Actual savings (13)=(11) x(12)	Total savings (14)=(10) +(13)	Program's net benefits (15)=(14) -(7)
1983	10.02	0.43	2.95	15.50	28.90	8.63	20.27	22.38	0.00	0.00	122.88	0.00	0.00	0.00	-20.270
1984	8.08	0.54	5.90	20.70	35.22	9.03	26.19	24.61	0.10	2.46	123.55	0.10	12.36	14.82	-11.370
1985		0.43	5.90	29.90	36.23	9.47	26.76	27.06	0.35	9.47	124.22	0.30	37.27	46.74	19.980
1986			3.30	44.60	47.90	9.90	38.00	29.75	0.60	17.85	124.90	0.50	62.45	80.30	42.300
1987			2.95	47.40	50.35	10.36	39.99	32.71	0.80	26.17	125.58	0.70	87.91	114.08	74.109
1988				46.89	46.89	10.83	36.06	35.96	1.00	35.96	126.26	0.90	113.63	149.59	113.053
1989				49.45	49.45	11.34	38.11	39.54	1.00	39.54	126.95	1.00	126.95	166.49	128.038
1990				52.01	52.01	11.87	40.14	43.47	1.00	43.47	127.64	1.00	127.64	171.11	130.970
1991				54.57	54.57	12.41	42.16	47.79	1.00	47.79	128.93	1.00	128.33	176.12	133.960
1992				57.14	57.14	12.99	44.15	52.55	1.00	52.55	129.03	1.00	129.03	181.58	137.430

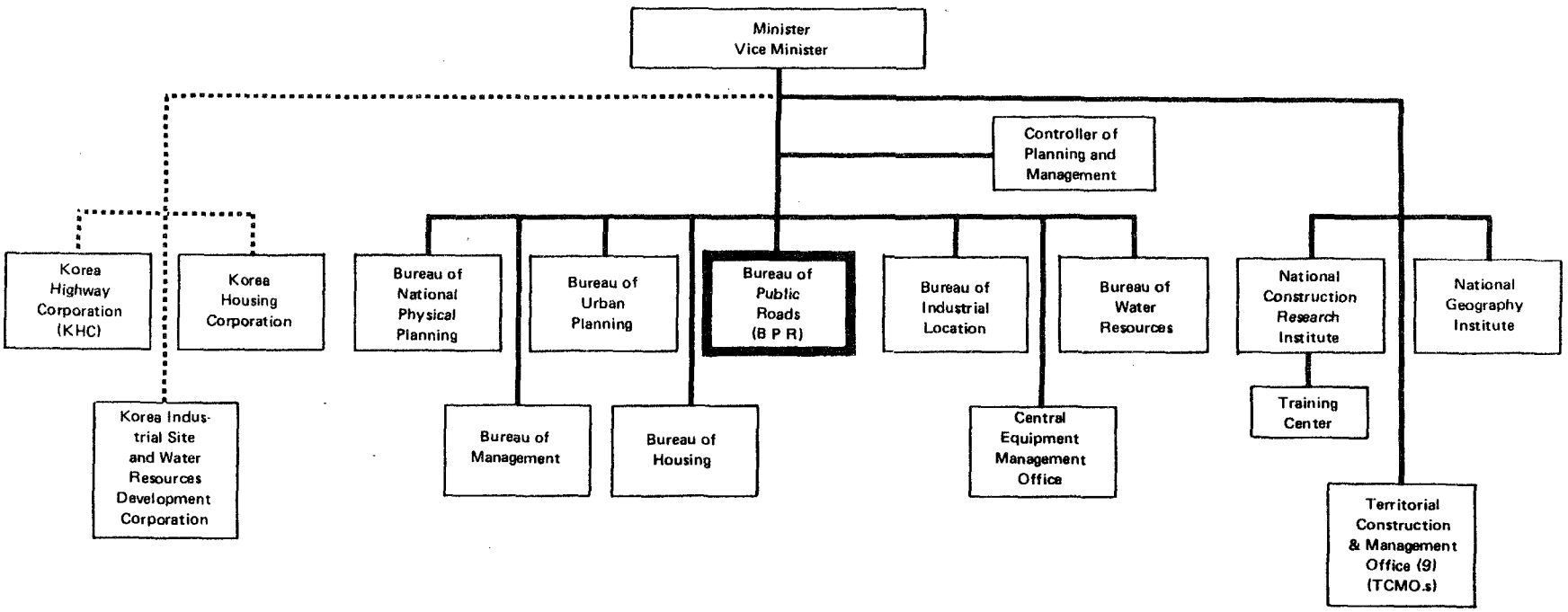
	Internal rates of return	Benefit/cost ratios /a
Most likely result	92.1%	2.43
Sensitivity Analysis:		
Cost increase by 20%:	74.8%	2.03
Benefit decrease by 25%:	65.7%	1.83
Cost increase by 20% and benefit decreased by 25%	51.0%	1.52

/a Discount rate = 20

Source: Consultants' and mission's estimates

September 1982

KOREA
PROVINCIAL AND COUNTY ROADS PROJECT
Ministry of Construction: Organization

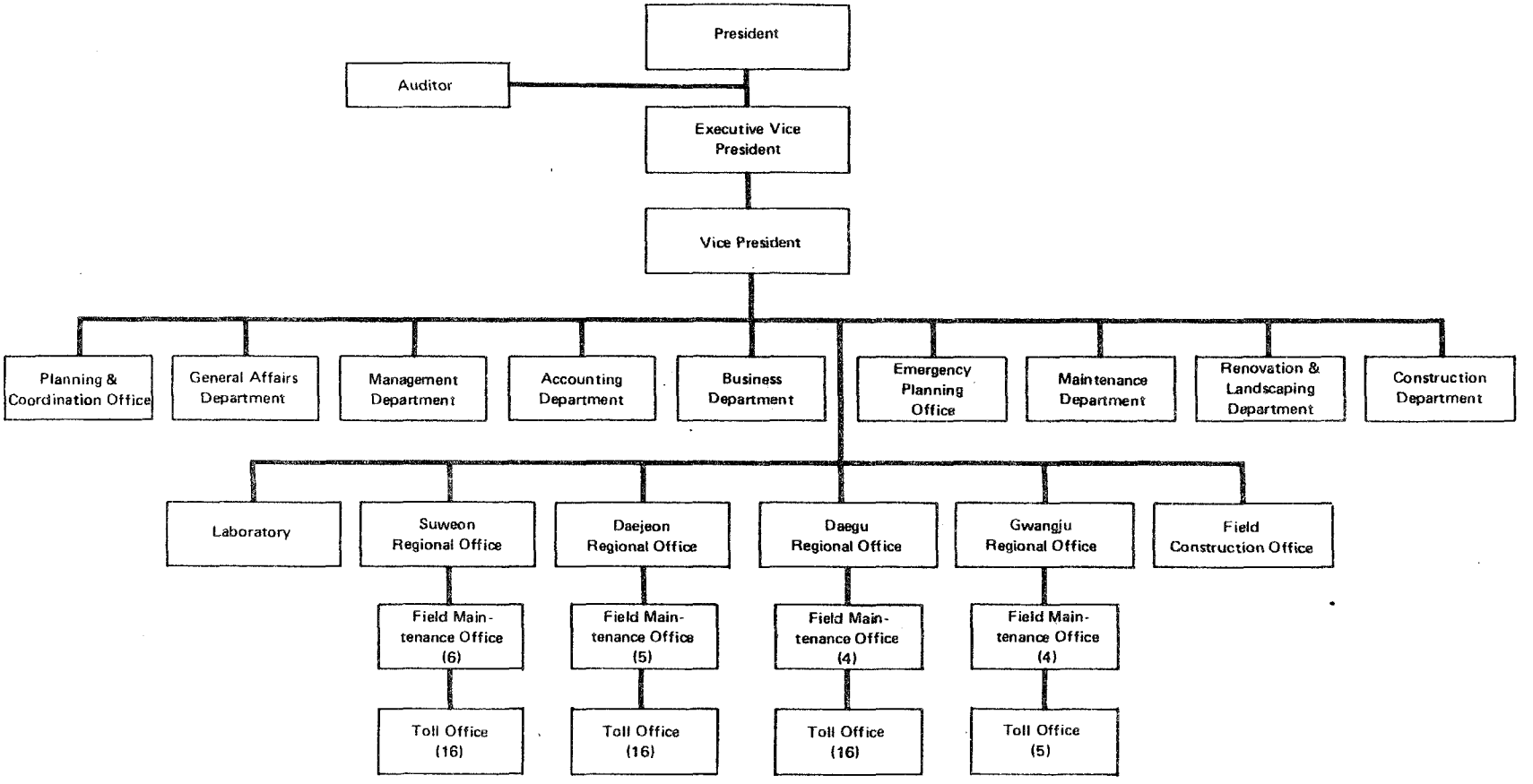


Source: Ministry of Construction

World Bank – 19014

CHART 1

KOREA
PROVINCIAL AND COUNTY ROADS PROJECT
Korea Highway Corporation: Organization

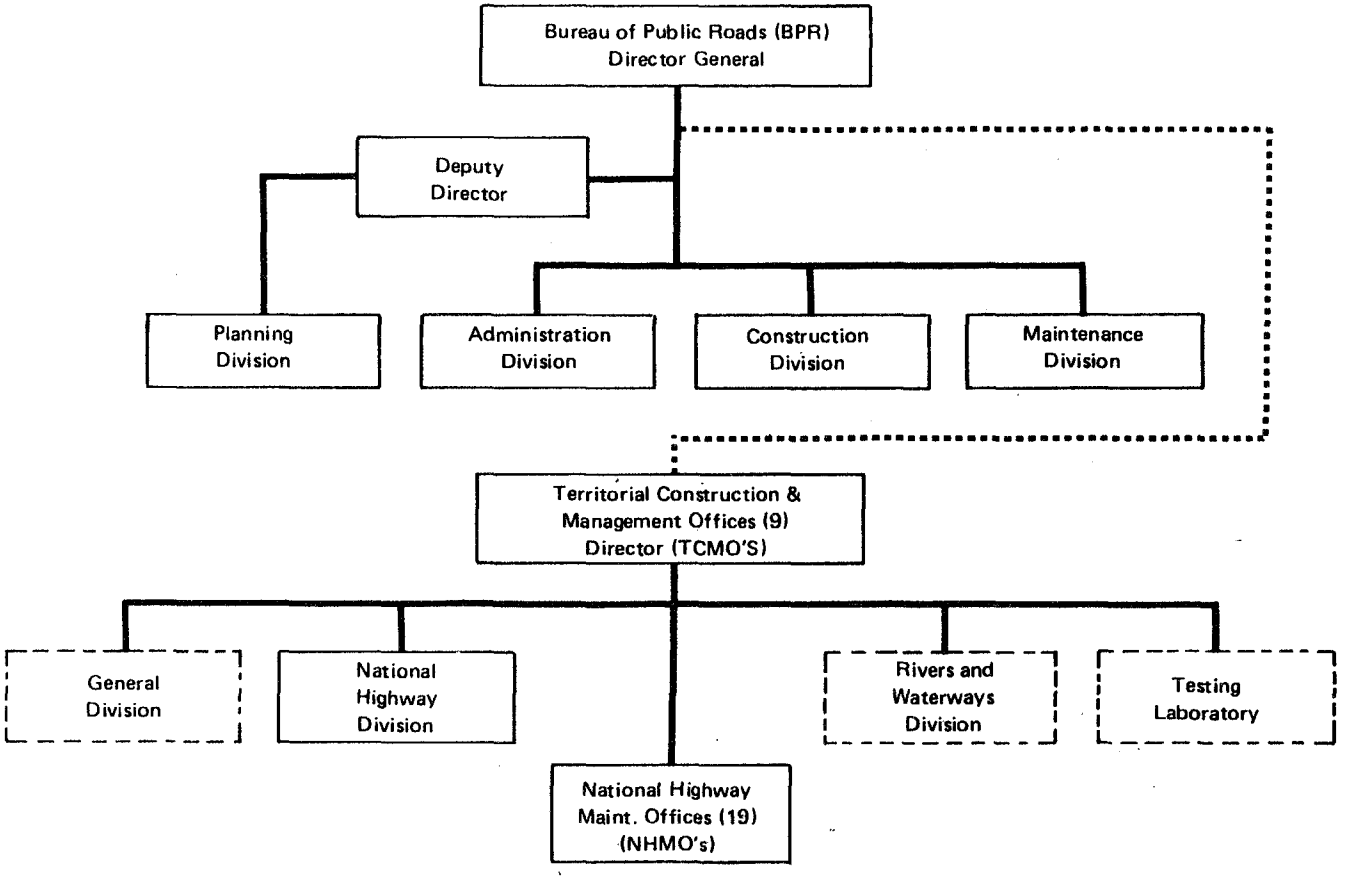


Source: Ministry of Construction

World Bank – 19016

CHART 2

KOREA
PROVINCIAL AND COUNTY ROADS PROJECT
Bureau of Public Roads: Organization

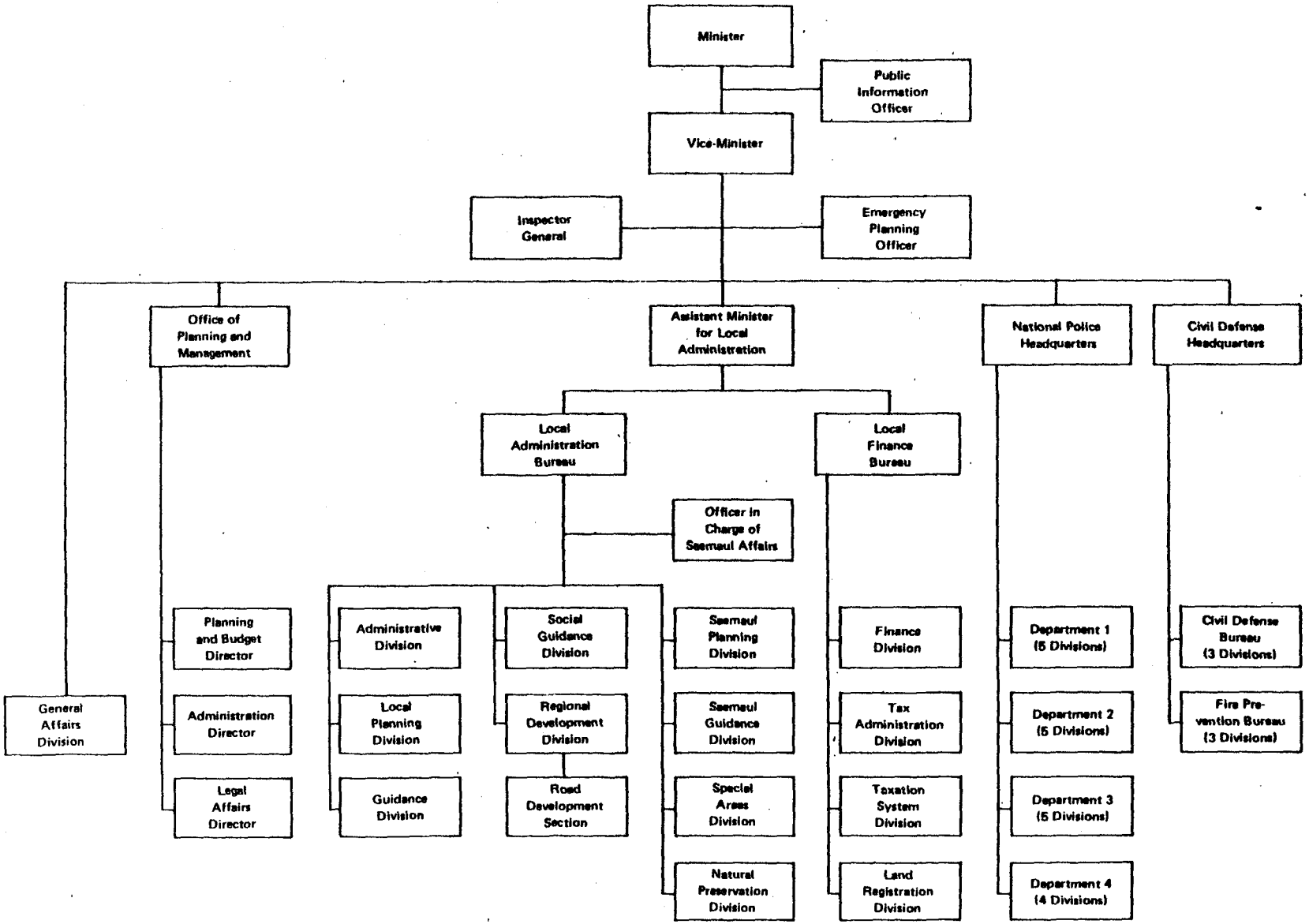


Source: Ministry of Construction

World Bank – 19015

CHART 3

KOREA
PROVINCIAL AND COUNTY ROADS PROJECT
Ministry of Home Affairs: Organization



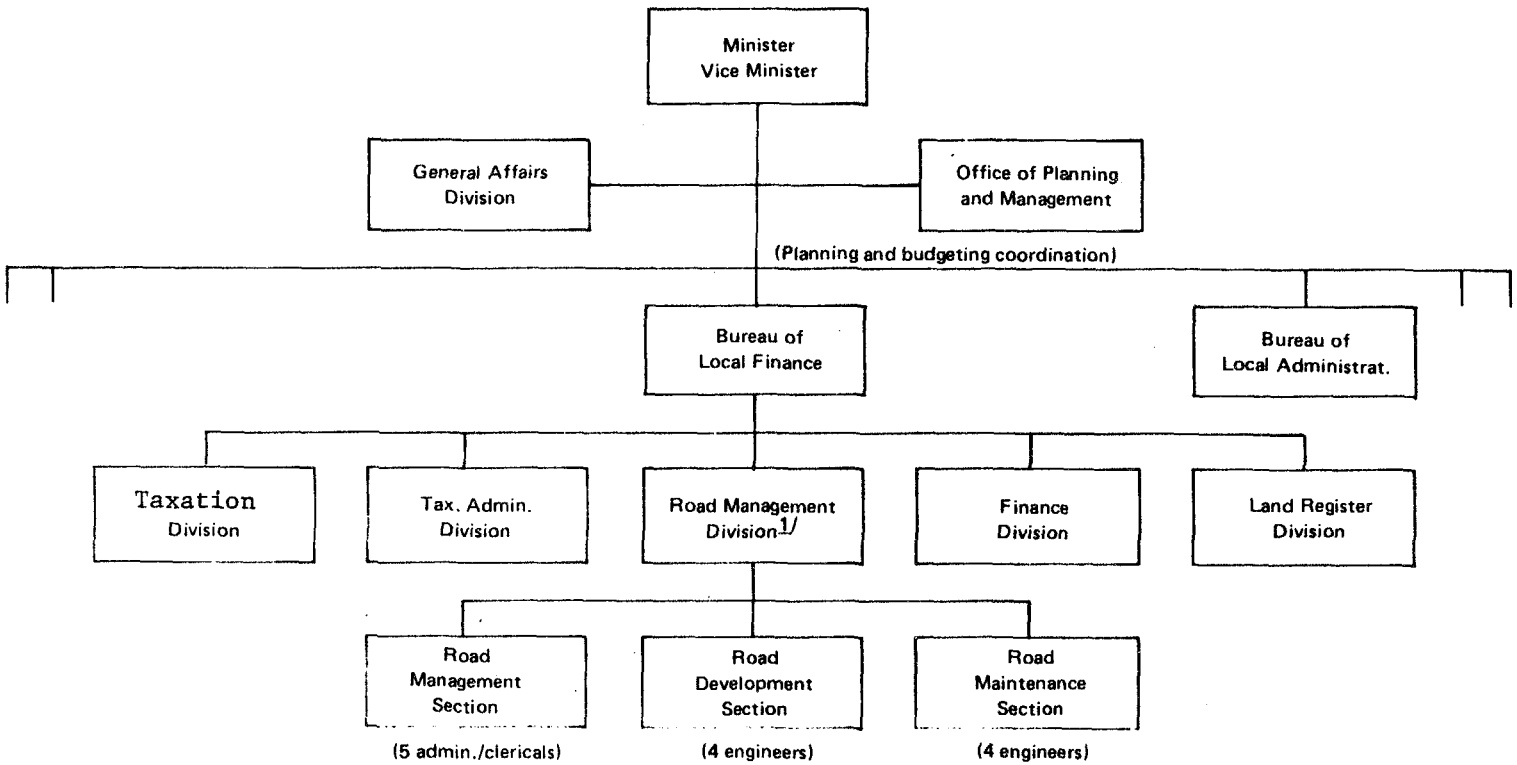
Note: The Road Development Section is to be upgraded to a Road Management Division--see Chart 5.

Source: Ministry of Home Affairs
June 1982

World Bank--24249

CHART 4

KOREA
PROVINCIAL AND COUNTY ROADS PROJECT
MOHA Organization for Road Management



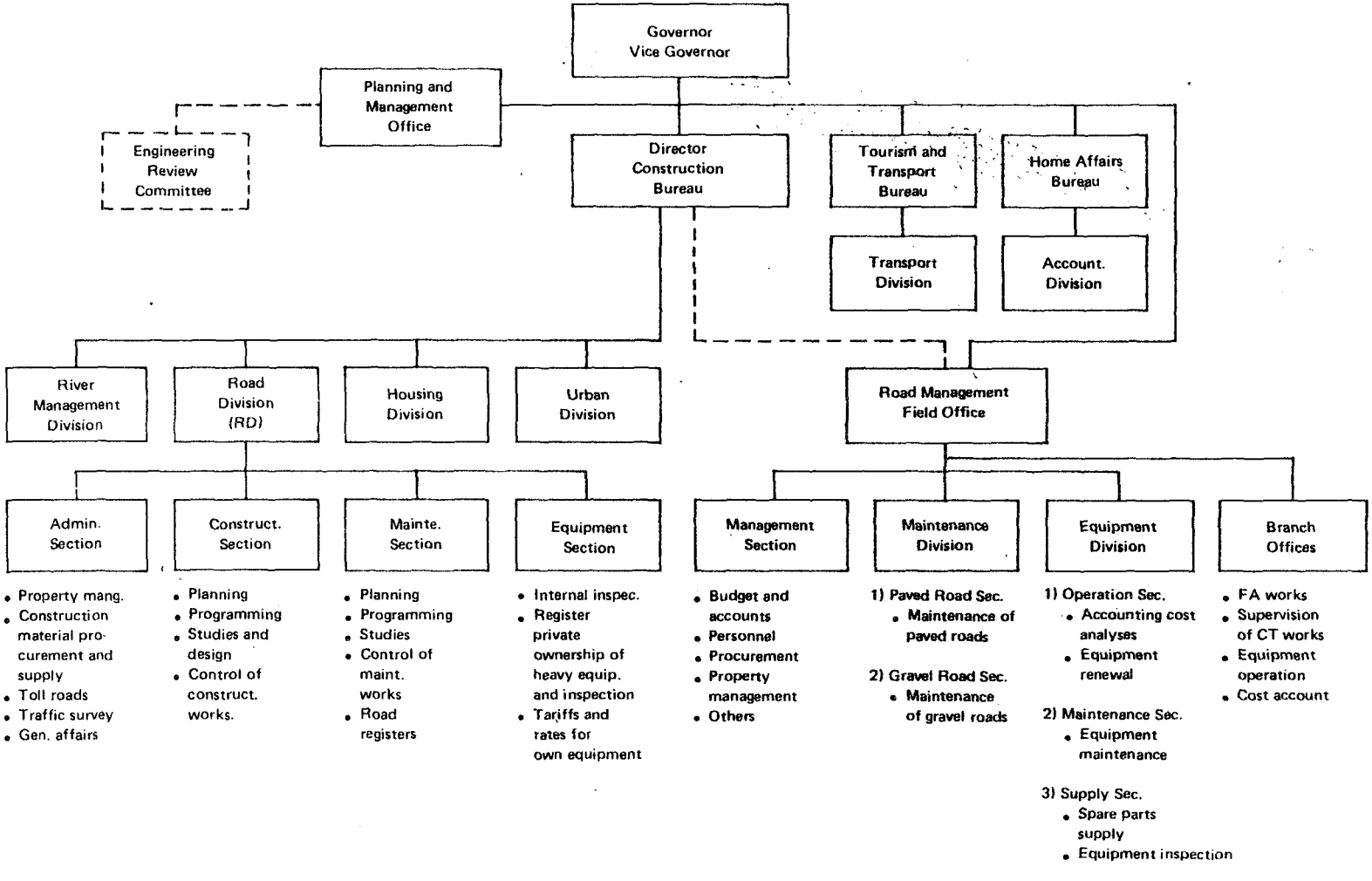
1/ Proposed

Source: Ministry of Home Affairs
June 1982

World Bank–24250

CHART 5

KOREA
PROVINCIAL AND COUNTY ROADS PROJECT
Road Organization at Provincial Level



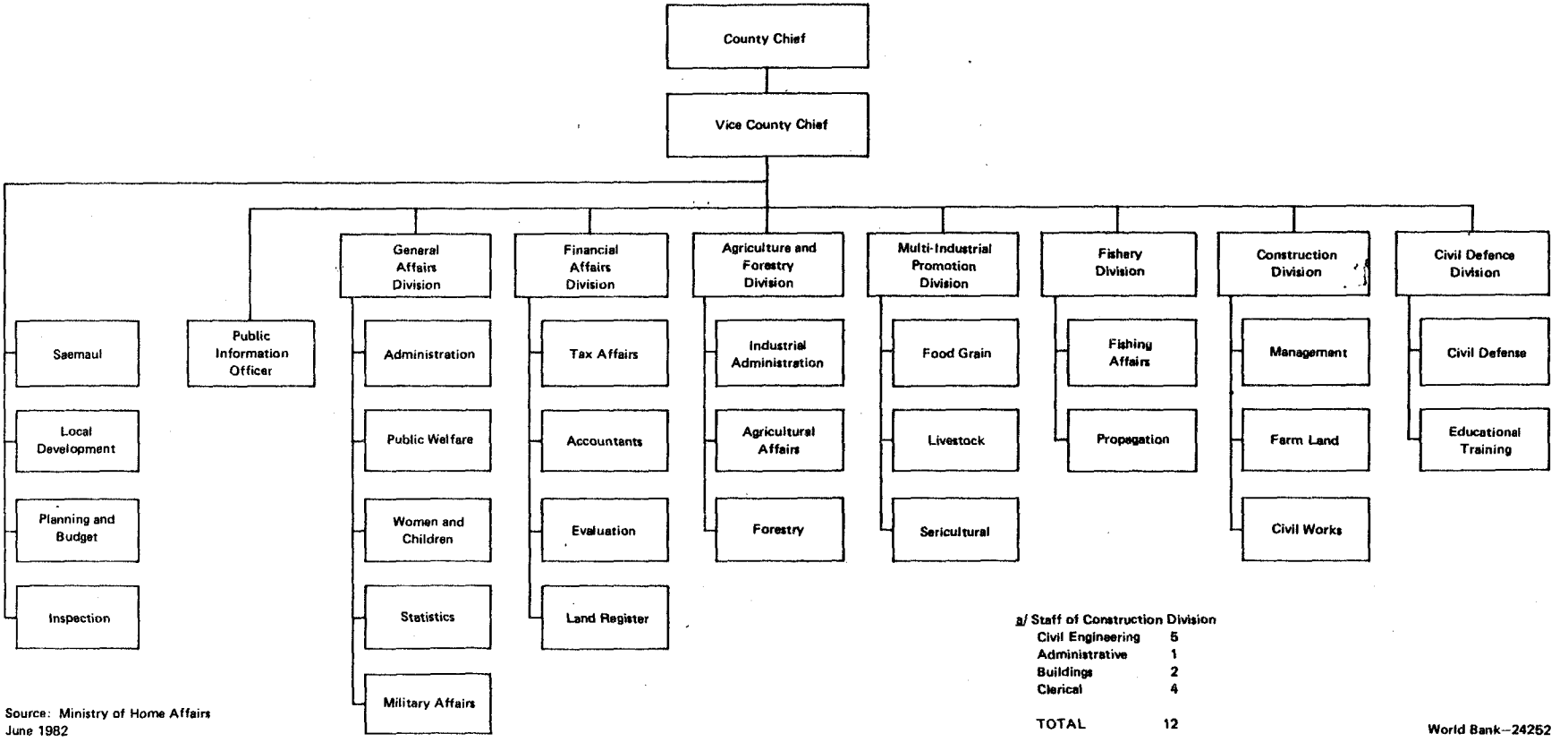
Source: Ministry of Home Affairs
June 1982

World Bank-24251

CHART 6

CHART 7

KOREA
PROVINCIAL AND COUNTY ROADS PROJECT
A Typical County (Gun): Organization



a/ Staff of Construction Division

Civil Engineering	5
Administrative	1
Buildings	2
Clerical	4
TOTAL	12

Source: Ministry of Home Affairs
June 1982

World Bank–24252

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Project Implementation Schedule

	Implementation	
	Start	Complete
Part A. Gun Road Improvement		
Prequalification of contractors	Sep 17, 1982	Dec 15, 1982
Issue bid invitation to prequalified contractors		Jan 31, 1983
Receive and open bids, evaluation with assistance of consultants, receipt by Bank of Copy of Evaluation Report and Government recommendations	Mar 15, 1982	May 15, 1983
Appoint consultants for supervision of improvement works and award contracts	May 1, 1983	Dec 31, 1986
Construction of gun roads	May 15, 1983	Dec 31, 1986
Part B. Procurement of Road Maintenance Equipment		
Prepare equipment list, specifications and bid documents and submit to Bank for review (OSROK)		Nov 15, 1982
Advertise internationally inviting potential bidders to apply for bid documents (OSROK)		Dec 15, 1982
Invite and receive bids for equipment and spare parts (OSROK)	Jan 30, 1983	Mar 31, 1982
Evaluation of bids and receipt by Bank of report on evaluation with Governments recommendation (OSROK)	Mar 31, 1983	Apr 30, 1983
Award contracts for supply of equipment and spare parts (OSROK)	First package Second package	May 31, 1983 May 31, 1984
Complete delivery of equipment and spare parts (OSROK)	First package Second package	November 1983 November 1984

	Implementation	
	Start	Complete
Part C. Provincial and Gun Road Pilot Maintenance Program		
Establish and staff Road Management Section	-	Dec 31, 1982
Establish and staff Road Maintenance Section	-	Apr 30, 1983
Establish and staff the Road Management Division in MOHA	-	Dec 31, 1984
Appoint technical assistance consultants		July 1, 1983
Preparation and implementation of maintenance systems, procedures in accordance with schedule in Consultants' Terms of Reference	Aug. 1, 1983	
Implementation of the maintenance program for the 3 pilot provinces and for paved roads in other provinces	Aug. 1, 1983	In progress
Submission to IBRD of review and program evaluation of pilot		Sep 1, 1984
Agreement with IBRD on recommendations for proceeding with maintenance program in remaining 6 provinces	-	Nov 1, 1984
Implement maintenance in all provinces	Dec 1, 1984	In progress
Part D. Consulting Services		
Detailed Engineering for 1,000 km at country roads	May 1, 1983	Apr 1, 1984
Assistance in implementing an on-site training program for Korean contractors and MOHA and MOC engineers in DBST	May 1, 1983	Jun 30, 1983
Study for the integrated investment planning for roads	May 1, 1983	Dec 31, 1983
Road Safety Study	Jul 1, 1983	Sep 30, 1983
Part E. Overseas Fellowships		
Select candidates	Feb 1, 1983	Aug. 1, 1983
Implement training	-	Dec 31, 1986

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Project Monitoring Indices

Project component	Estimated	Actual	Actual as % of estimated	Reason for difference (if any)	Actions to be taken
1. Gun Road Construction					
(a) Contract awards (dates)					
(b) Earthworks completed (cu m)					
(c) Subbase and base completed (km)					
(d) Paving completed (km)					
(e) Culverts (number)					
(f) Bridges (_____)					
(g) Construction work completed (date)					
(h) Maintenance certificate issued (date)					
(i) Compleion certificate issued					
(j) Final cost					
2. Supervision at Construction (m/months)					
3. Provincial and County Road Maintenance Program					
Provincial Roads					
(a) Routine					
(b) Periodic					
(c) Rehabilitation					
County Roads					
(a) Routine					
(b) Periodic					
(c) Rehabilitation					
Technical Assistance					
(a) Transport economist [planned (m/months)]					
(b) Highways engineer (m/months)					
(c) Finance manager/accountant (m/months)					
(d) Equipment manager (m/months)					
4. Detailed Engineering of 1,000 km County Road					
(a) Consultants selected and contract award (date)					
(b) Completion rate (km)					
(c) Experts					
(i) Local (m/months)					
(ii) Foreign (m/months)					
(d) Draft final report (date)					
(e) Final report (date)					
(f) Completion of engineering drawings and bid document					
5. Studies					
Highway Coordination					
(a) Consultant contract (date)					
(b) Draft final report (date)					
(c) Final report (date)					
Road Safety					
(a) Consultant contract (date)					
(b) Draft final report (date)					
(c) Final report (date)					
6. Contractor Training Program					
(a) Consultant contract (date)					
(b) Draft final report (date)					
(c) Final report (date)					
(d) Work completed					
(e) Number of trainees					
(i) Contractors staff (number)					
(ii) Engineers/MOHA and MOC (number)					
(f) Completion report (date)					
7. Overseas Fellowships					
(a) Selection (date)					
(b) Implementation (number, type of training, duration					

KOREA

PROVINCIAL AND COUNTY ROADS PROJECT

Selected Documents and Data Available in the Project File

A. General Reports and Studies on the Sector or Subsector

A.1. "Korea - Transport Statistics" prepared by AEPTl.

B. General Reports and Studies Relating to the Project

B.1. "Gun Road Development Study" Final Report dated December 1981 prepared by BCEOM and Saman Engineering Corporation

B.2. "Provincial and Gun Road Maintenance Study" Final Report dated December 1981 prepared by BCEOM and Saman Engineering Corporation

B.3. "Detailed Engineering Services of Gun Roads" Final Report prepared by BCEOM and Korean Consultants, dated September 1982

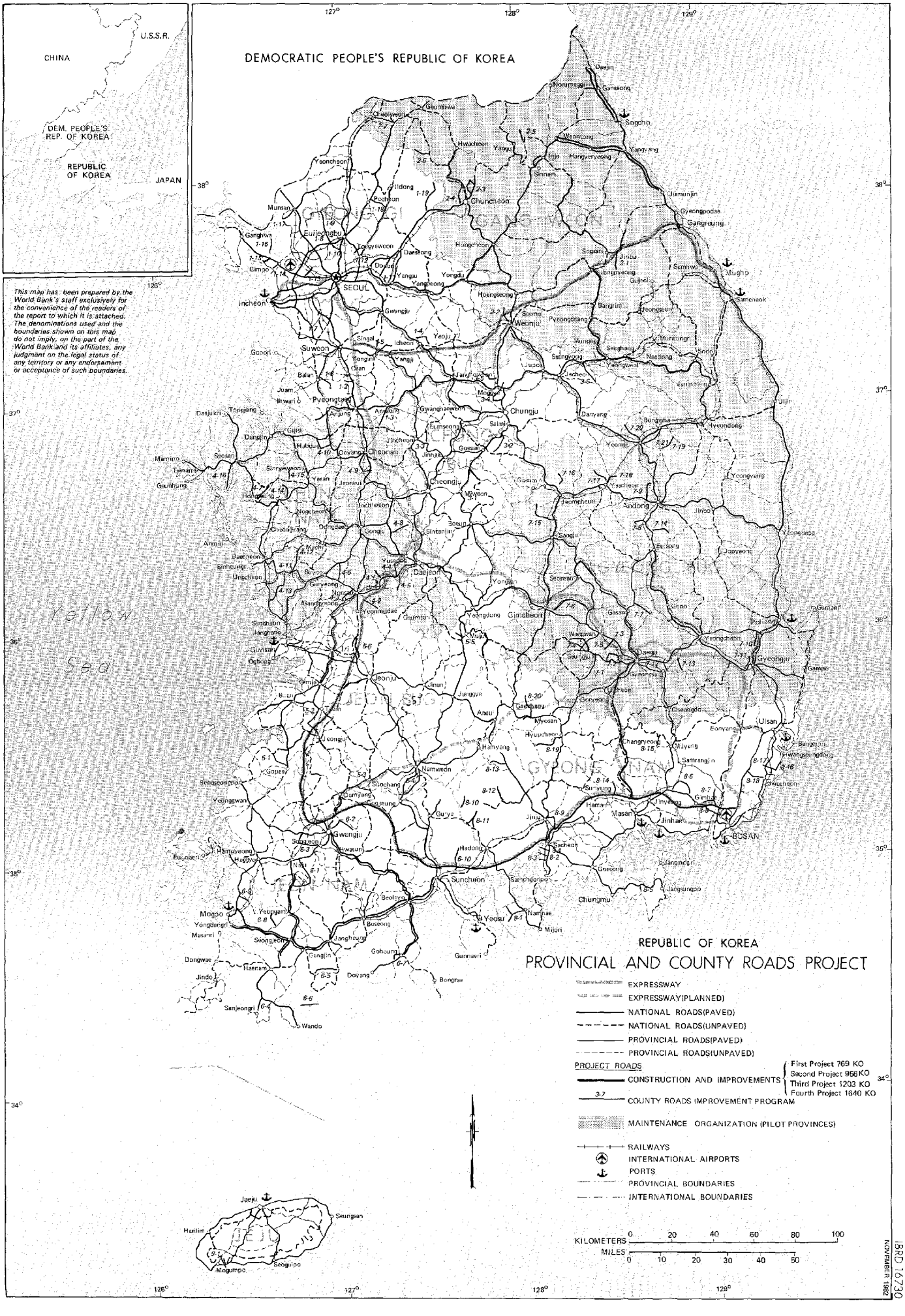
C. Selected Working Papers

C.1. Calculations of Economic Benefits and Costs for County Road Projects

C.2. Calculations of Economic Benefits and Costs for Provincial and County Road Maintenance Program

C.3. Engineering Drawings for County Roads

C.4. Detailed maps showing location of County Roads



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NOVEMBER 1982